Mining CONGRESS JOURNAL

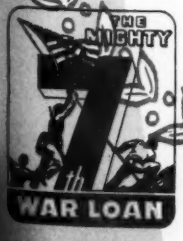
JUNE 1945

TO THE AMERICAN PEOPLE:

Your sons, husbands and brothers who are standing today upon the battlefronts are fighting for more than victory in war. They are fighting for a new world of freedom and peace.

We, upon whom has been placed the responsibility of leading the American forces, appeal to you with all possible earnestness to invest in War Bonds to the fullest extent of your capacity.

Give us not only the needed implements of war, but the assurance and backing of a united people so necessary to hasten the victory and speed the return of your fighting men.



with anthracite's most Powerful Electric Hoist

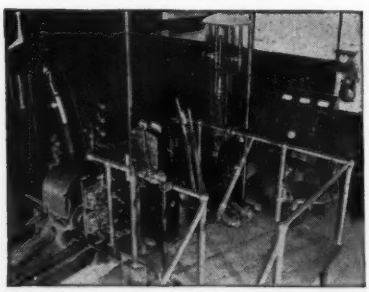
. . . 93 trips per hour to surface 420 tons of coal—*that's real production!* And that's the everyday record for this Westinghouse powered and controlled mine hoist—the most powerful in the anthracite field.

It takes a lot of horsepower to do a job like this—1750 in fact—supplied by this powerful pedestal-type, wound-rotor Westinghouse induction motor. Operating on 2200-volt, 3 phase, 25 cycle power, the motor drives a large gear unit, connected to a conical drum carrying the 1700 ft. of 1⅝" steel cable used to raise and lower the cages.

This hoist replaces an old 30 x 60 steam unit—and provides faster and more economical hoisting.

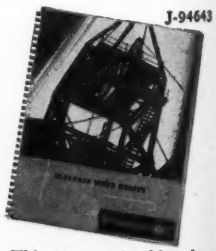
Conditions surrounding this installation were such that the purchase of low-cost, highly efficient alternating current equipment was recommended by Westinghouse engineers after a study of the requirements.

This is just another example of the ability of Westinghouse to solve the toughest mining problems. For a simple solution to your complex electrical problems, call your nearest Westinghouse Office. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.



CONTROL STATION—Primary hoist control is furnished by electro-pneumatically operated contactors. Secondary control gives 10-point acceleration through adjustable relays of the definite time-limit inductive type, operating on the last seven contactors. The first three points are under manual control. An electro-pneumatically operated air-brake contactor provides for reversal on the 2200-volt circuit.

J-94643



This 90-page booklet gives complete information on how to select electric hoist equipment to meet your special requirements. Write for free copy of B-3055 today.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

ELECTRICAL EQUIPMENT FOR THE MINING INDUSTRY

Mining Congress Journal

VOLUME 31, NUMBER 6 FOR JUNE 1945

Contents

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	Page
Editorials	19
Portable Shovel Switch-Houses By GEORGE J. REYNOLDS.	20
New Zinc Mines in the old Galena District of Illinois By FRANCIS CHURCH LINCOLN.	26
Mine Drainage in the Anthracite Region By GEORGE A. ROOS.	32
Mine-Ventilation Safety Door By EDWARD F. COURTNEY AND JOHN A. JOHNSON.	35
Underground Power By J. O. CREE.	37
American Mining Congress Opposes Further Tariff Cuts By JULIAN D. CONOVER.	41
Underground Formation and Suppression of Coal Dust By D. H. DAVIS.	47
Wheels of Government	53
Personals	57
News and Views	59
Manufacturers Forum	74

Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress.

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THE AMERICAN MINING CONGRESS

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Published Monthly. Yearly subscriptions, United States, $2.00. Canada and Foreign, $4.00. Single copies, $0.20. February Annual Review Issue, $0.75. Entered as Second-Class Matter, January 30, 1915, at the Post Office at Washington, D. C.

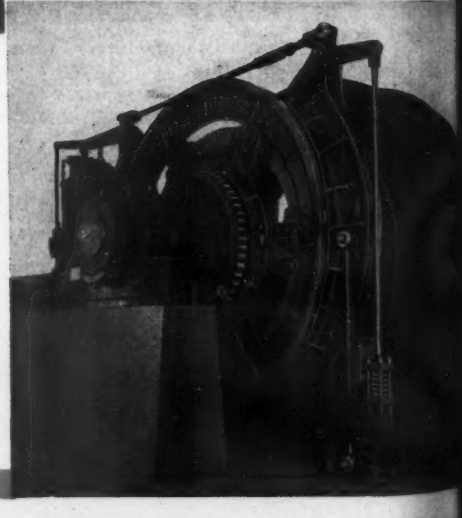
Member, Audit Bureau of Circulations

LEHIGH NAVIGATION COAL COMPANY BOOSTS OUTPUT ONE-THIRD IN 1943

Establishing a new anthracite production record, the workers of the Lehigh Navigation Coal Company in the Panther Creek Valley of Pennsylvania, produced one-third more coal in 1943 than in 1942. Total commercial production in 1943 was 4,092,820

THEN.. "Navigation" took another step forwar

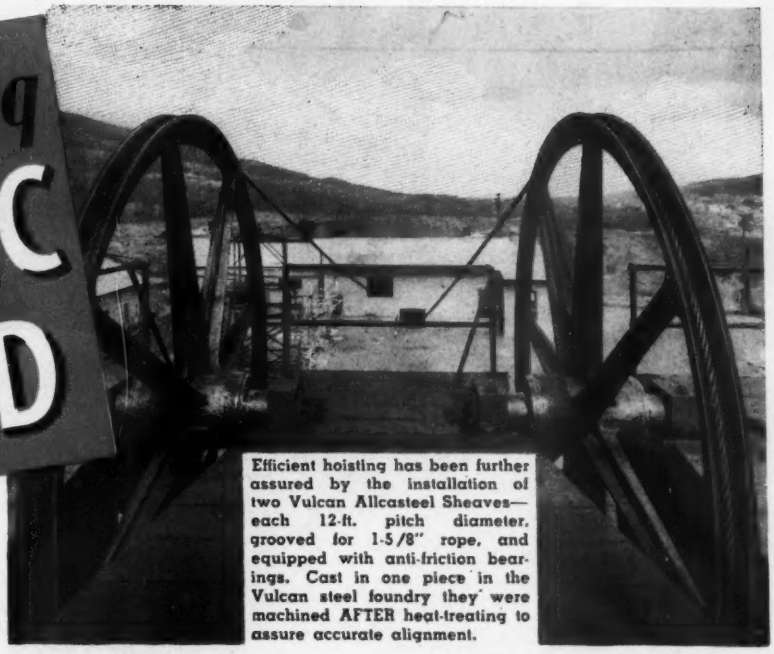
the MOST POWERFUL EL HOIST IN THE ANTHRACITE



ABOVE: Navigation hoist partially assembled in Vulcan erecting shop before being taken down for shipment. Gear guards not installed. Experienced mining men will recognize the powerful air-operated brake engines and (immediately in front of operator) the Vulcan Safety Devices which provide dependable protection against over-winding, over-speeding, power-failure or mistakes of any kind on the part of the operator. In any of these events the hoist stops—quickly but smoothly—and cannot be started again until normal conditions have been restored.

AT RIGHT: Rear view of hoist showing positive toothed-type clutch with air-operated clutch engine and parallel-motion post-type brake with pressure-graduating rig. The latter is an exclusive Vulcan feature which permits smaller initial clearance between brake-shoe and drum without danger of dragging and assures smoother, more uniform braking action than would otherwise be possible.

...ward by installing L ELECTRIC ...ITE FIELD



Efficient hoisting has been further assured by the installation of two Vulcan Allcasteel Sheaves—each 12-ft. pitch diameter, grooved for 1-5/8" rope, and equipped with anti-friction bearings. Cast in one piece in the Vulcan steel foundry they were machined AFTER heat-treating to assure accurate alignment.

WHEN war-time needs for other fuels increased the demand for anthracite far beyond that of any other recent period the Lehigh Navigation Coal Company was ready—with completed improvements, above and below ground, which enabled a loyal working force to increase its 1943 output over that of 1942 by more than a million tons.

Then "Navigation" took another big step forward by installing the most powerful electric hoist in the anthracite field, so that even greater production could be secured from its famous Coaldale Colliery. Powered by a 1750 hp. motor, its cylindro-conical tight-and-loose drums are 9 to 15 ft. in diameter—each drum grooved to stow 1676 ft. of 1-5/8" rope. We appreciate and gratefully acknowledge the opportunity afforded us to cooperate with the engineering executives of the Lehigh Navigation Coal Company in the design and manufacture of this great hoist and thereby to increase, importantly, our own contribution toward the winning of the war.

Write us regarding any heavy-duty hoisting requirement that will aid the war effort. Hundreds of successful installations throughout the United States and many other countries enable Vulcan engineers to make helpful suggestions—without charge or obligation of any kind.

VULCAN IRON WORKS

Established 1849

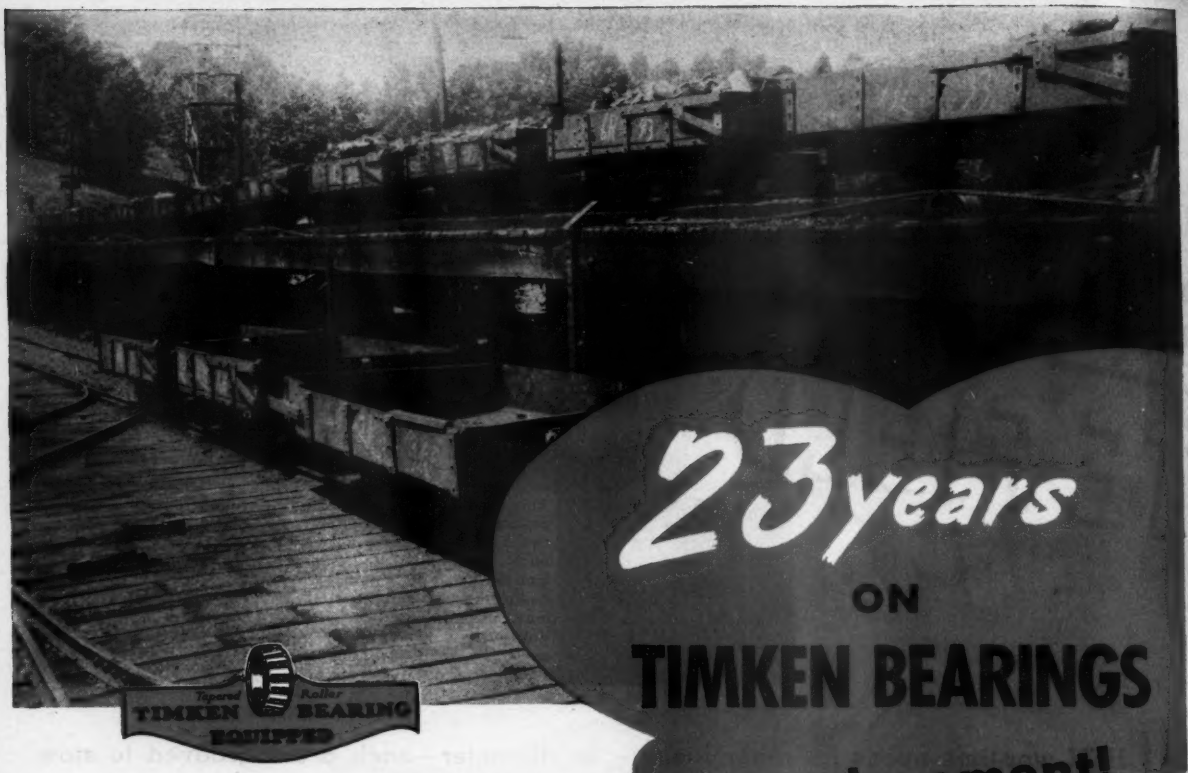
Main Office and Works **WILKES-BARRE, PA.,** New York Office 50 Church

Heavy-Duty Electric Hoists
Self-Contained Hoists
Scraper Hoists
Car-Spotting Hoists
Room Hoists

Shaking-Chute Conveyors
Chain Conveyors
Cast-Steel Sheaves and Gears
Cages, Skips and Gunboats
Coal-Preparation Equipment

Steam Locomotives
Diesel Locomotives
geared and electric drive
Gasoline Locomotives
geared and electric drive

Load-Carrying Larries
Rotary Kilns, Coolers and Dryers
Crushing Rolls and Pulverizers
Briquetting Machines
Ball, Rod and Tube Mills



23 years ON TIMKEN BEARINGS without a single bearing replacement!

Where "Timken Bearing Equipped" mine cars work, lowered operating costs and a consequent increase in profits invariably results. Convincing confirmation of this fact is found again in the experience of The New River Company of Mount Hope, West Virginia, who are one of the largest producers in the New River Smokeless field.

At their Sprague Mine on the outskirts of Beckley, W. Va. 175 car sets of Timken Bearings have been operating continuously for 23 years without a single bearing failure. So gratifying has been this enviable performance record, they now have more than 4000 cars in constant operation and rolling on Timken Bearings.

This is typical Timken Bearing performance and the reason they are preferred by the mining industry. Operators everywhere know that Timken Bearings mean greater tonnage hauls at faster train speeds with less power consumed. They know, too, that there'll be less wheel breakage, simplified economical lubrication and greatly reduced maintenance and they insist on these advantages. You, too, can enjoy these benefits by being sure the trade-mark "TIMKEN" is on every bearing you buy. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

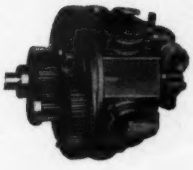
MUCK PILES GO DOWN FASTER WITH THIS BIG BITE!

The bigger the bite, the faster you can load out your mine cars. And the "big bite" of the Gardner-Denver G-D 9 mine car loader is the secret of its ability to assure bigger tonnages . . . faster production . . . lower operating costs.

The G-D 9 picks up more rock, lifts it faster, discharges it quicker . . . even in blocky ground. To step up your tonnage, choose the loader with the "big bite" . . . the G-D 9.

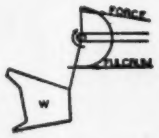
For complete information on the G-D 9, the loader with the "big bite," write Gardner-Denver Company, Quincy, Illinois.

THE G-D 9 GIVES YOU:



1. MORE POWER

Two powerful, five-cylinder air motors give the G-D 9 plenty of power to crowd into the muck pile and take a "big bite."

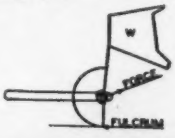


2. GREATER CROWD

The G-D 9 has greater crowding action because, at start of cycle, force is applied to top of rocker where it is needed to get a big bite and a full dipper every time. Small effective diameter of nearly empty winding reel adds power.

3. FASTER LIFT

As filled dipper is raised clear of muck pile, the application of force changes to mid-point of rocker. This, plus the greater effective diameter of the full winding reel, increases speed of the dipper as it nears the discharge position.



4. FASTER DISCHARGE

Because dipper has reached maximum speed as it nears the discharge position, G-D 9 discharges its entire load cleanly. This "fulcrum" principle speeds loading of cars. No time and power are wasted on partially loaded dippers.

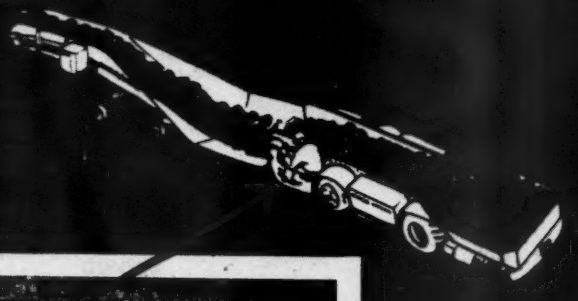
5. GREATER SAFETY

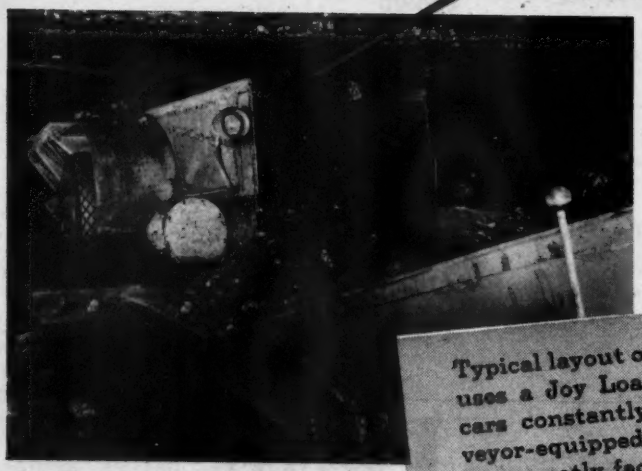
The low center of gravity of the G-D 9 assures more stability—safer operation. Loaders stay on the track—do not tip or fall.

GARDNER-DENVER *Since 1859*

JOY MECHANIZED MINING

handles coal fast... at low cost per ton



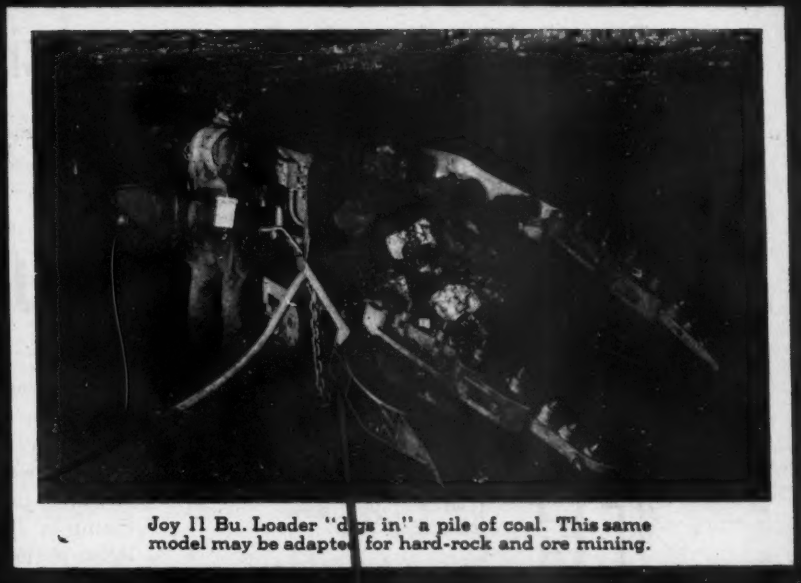


Joy Elevating Chain Conveyor handles coal from shuttle car into the mine car.

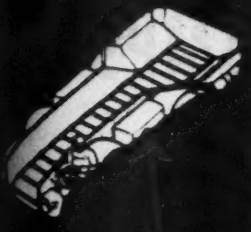
Typical layout of a shuttle car mine which uses a Joy Loader to keep three shuttle cars constantly on the move. The conveyor-equipped bottoms of the shuttle cars greatly facilitate even distribution of the load and permit quick unloading at the main entry.

Speedy handling is the keynote of today's wartime production. And speedy handling . . . with emphasis on the economy of operation . . . will be the factor that determines whether you have red ink or black on your books in postwar years. Begin now to analize your facilities once again.

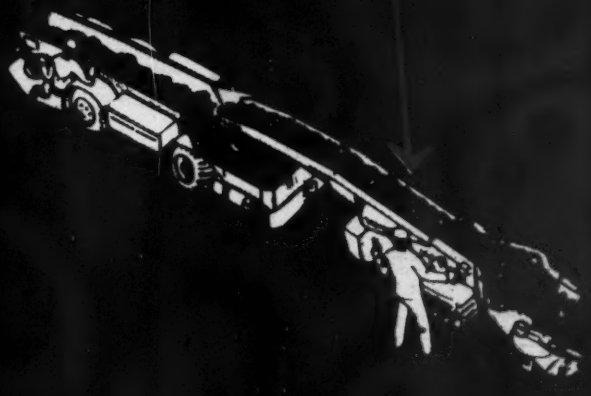
Joy Shuttle Car Mining operations have proved to be successful from the standpoint of speedy handling of large tonnage, as well as from a low operating cost viewpoint. Because Joy Equipment is especially constructed . . . sturdily built . . . economical to operate, it will pay you to investigate the possibilities of working it into your mining set-up.



Joy 11 Bu. Loader "digs in" a pile of coal. This same model may be adapted for hard-rock and ore mining.



Rear view of Joy Shuttle Car showing wide conveyor type bottom.



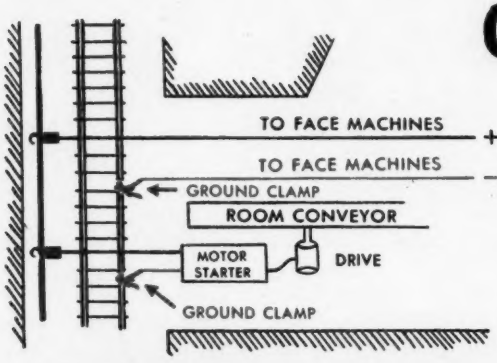
JOY MANUFACTURING CO. *Call in a Joy Engineer*

FRANKLIN, PA.

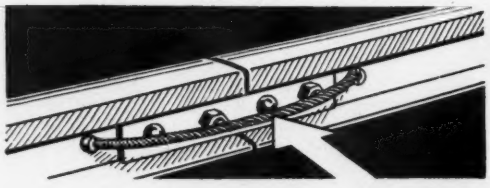
For tight, vibrationless return circuit connections

Use O-B Plier-Type

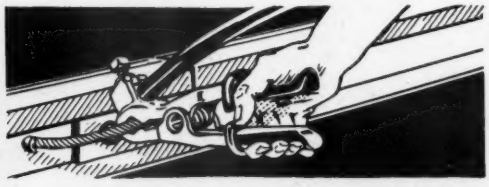
GROUND CLAMPS



Typical room neck layout showing O-B Plier-Type Ground Clamps being used to connect both the room cables and motor starter ground leads to the return circuit. A junior size Plier-Type Ground Clamp is also available for connecting light, portable electrical equipment.



Plier-Type Ground Clamps may be connected either to the rail bond strand, as illustrated here, or to the negative feeder if available.



Safe rubber handles protect the operator from electrical shock.

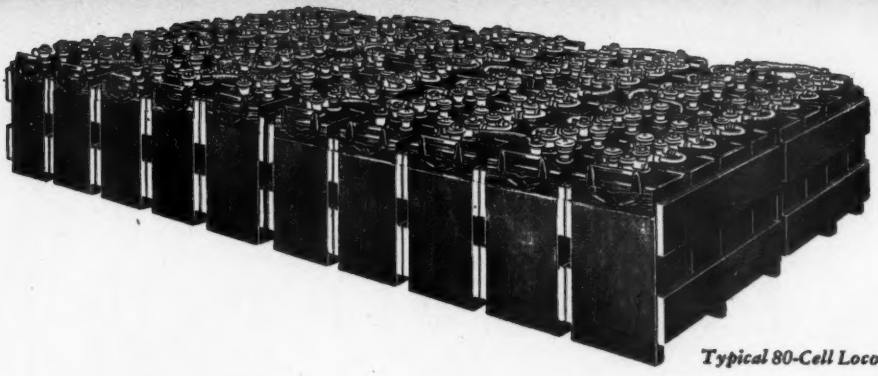
NO. 2554-M

TWO SIZES AVAILABLE	For the following range of bond cable or negative feeder sizes . . .	And the following range of machine cables.
Standard Size, No. 19383	No. 1 to 1,000,000 CM	No. 14 to 4/0
Junior Size, No. 19907	No. 1 to 4/0	No. 14 to No. 4

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.



Typical 80-Cell Locomotive Battery

WHAT USERS DISCOVER

In Mine Locomotives and Shuttle Cars Alkaline Batteries Give You These Important Advantages

- They are **durable mechanically;** grids, containers and other structural parts of the cells are of steel; the alkaline electrolyte is a preservative of steel.
- They are **foolproof electrically;** are not injured by short circuiting, reverse charging or similar accidents; are free from self-deteriorating reactions.
- They can be **charged rapidly;** do not require critical adjustment of charge rates; can be charged directly from mine d-c supply.
- They **withstand temperature extremes;** are free from freezing hazard; are easily ventilated for rapid cooling.
- They can **stand idle indefinitely** without injury, without attention, and without expense.
- They are **simple and easy to maintain.**

Ask a user of Edison Alkaline Batteries what he thinks of them as power units for locomotives and shuttle cars. The chances are he'll say they provide the closest approach to failure-free uninterrupted haulage power he knows of — and are economical, too.

He may at some time have had a wreck — such as a locomotive falling into a shaft or rolling down the side of a waste dump — and found that the battery not only survived with little or no damage but later went on and delivered full service life.

Or, he may have discovered that he can use "worn-out" motive-power batteries for various kinds of lighter-duty standby work for which their capacity is still ample, and thus can get more years of dependable service from them.

As a matter of fact, it is only by actually using Edison Alkaline Batteries that a person finds out how dependable and economical they really are. *Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J.*

Edison
ALKALINE BATTERIES

Now! KENNAMETAL DRILL BITS

. . . . WITH CUTTING TIPS OF TOUGH, HARD KENNAMETAL BRAZED INTO ONE-PIECE, DROP-FORGED, ALLOY STEEL SHANKS

Kennametal-tipped Drill Bits are now available, in the six sizes listed below, to increase production rates and reduce costs of mechanical drilling operations. They can be used in hand-held or post-mounted drills, as well as in track or rubber-tired drilling machines.

These revolutionary new bits are one-piece, alloy-steel drop forgings, heat-treated, with brazed-in cutting tips of durable Kennametal—the cemented carbide that is exceptionally tough and hard (75 to 76 Rockwell C compared to 66 to 67 for the hardest tool steels).

Kennametal Drill Bits have been thoroughly tested, and service results show that they can be fed at a higher rate with less power consumption, will drill far more footage before resharpening is required, and can be reground a score or more times. Their design assures continuous maintenance of hole gage, without over- or under-drilling. They cut very hard materials, making auger drilling practicable in some instances where previously it was impossible.

**To make fullest use of the advantages inherent in Kennametal Drill Bits, we have perfected a new, double-spiral, conveyor-type auger—a solid-center, rolled shape, made of forged alloy steel, heat-treated. Its sturdiness minimizes whip, and aids in maintaining gage. The driving shank is shaped to enable the auger to be quickly attached to, or detached from the machine simply by "a twist of the wrist."*

and AN ENTIRELY NEW TYPE DOUBLE-SPIRAL SOLID CENTER AUGER

SPECIFICATIONS

DRILL BIT DIA.	DRILL BIT CATALOG NO. Track or Post Mtd.	DRILL BIT CATALOG NO. Hand Held	AUGER ★ DIA.	AUGER ★ STYLE NO.	Purpose of Drilled Hole
1 3/16"	.....	D1-H	1 1/4"	1A	Trolley wire hanger
1 5/8"	D2-M	D2-H	1 3/8"	2A	1" or 1 1/4" powder stick
1 3/4"	D3-M	D3-H	1 1/2"	3A	1 1/2" or 1 1/4" powder stick
2 1/4"	D4-M	D4-H	1 3/4"	4A	1 1/4", 1 1/2", or 1 3/4" powder stick
2 1/2"	D5-M	D5-H	2 1/4"	5A	1 3/4" or 2" powder stick, 1 7/8" cartridge
3"	D6-M	D6-H	2 3/4"	6A	2 1/2" or 2 3/4" powder stick, 2-5/16" cartridge

★Supplied in all common operating lengths, or special lengths when desired. Twisted driving shank, on all sizes, is 1 3/4" diameter standard O.D. To provide complete interchangeability of augers, adapting sockets are available for application to all common types of drilling machines.

Write for additional information on Kennametal Drill Bits, giving details of your operations.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

How Saboteurs are FILTERED OUT!

It's a smart electric shovel that guards against such enemies as dust, dirt and grime. Their annual toll runs into mighty big figures — in reduced operating efficiency of electrical parts — in damage to equipment — in loss of productive time. On the new P&H Electric Shovels, a highly perfected cab ventilating system filters out these air-borne saboteurs. It keeps abrasives out of electrical machinery — keeps down shovel maintenance costs — steps up shovel working time.

Only clean air enters the P&H cab. Drawn in through filter banks by a centralized independent blower unit, the air is circulated to motors and generators. Once used, air is exhausted direct to the outside . . . not recirculated.

Here's an example of the care given to designing every detail of new P&H Electric Shovels in the interests of lower digging costs in open pits. Another example of P&H's 60 years of steady pioneering in applying electrical power to the movement of heavy loads.

P&H

ELECTRIC SHOVELS

4555 W. National Avenue
Milwaukee 14, Wisconsin

HARNISCHFEGER CORPORATION

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS • HOISTS • WELDING ELECTRODES • MOTORS

THE GREATEST FORWARD STEP EVER MADE IN ELECTRIC SHOVEL DEVELOPMENT

WHY A CUMMINS DIESEL ?..

In making a decision on the diesel you'll want for your heavy-duty mining operations—hauling, stripping, loading or stationary—consider *all* the "angles" . . . the men who build it . . . use it . . . service it.

More than 26 years of manufacturing experience devoted wholly and exclusively to diesels are represented in the modern Cummins Dependable Diesel . . . your assurance of the most advanced design and construction.

The list of Cummins Diesel owners includes many of the best-known and most successful operators in the mining industry . . . your assurance that Cummins Diesels have long been doing the very job you want done.

Cummins Dealers provide complete service facilities throughout the nation. They know the engine and know how to take care of it . . . your assurance that your Cummins Diesels will never be far from competent *Cummins Service.*

Built by men who are *diesel specialists* . . . the choice of men who demand the best in power . . . backed by dealers who fully appreciate the importance of service . . . these are the reasons why Cummins Dependable Diesels are your most profitable investment in power.

CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA

BRINGING COAL TO LIFE

FOR MILLIONS of Americans . . . colorful, informative advertising is dramatically portraying the *importance of coal* in their everyday lives . . . showing them how coal and its by-products are needed in war, transportation, agriculture, homes, medicine and other aspects of modern living.

Written in human terms, these advertisements help make the public conscious that coal is their friend . . . that the coal industry contributes to their well-being in countless ways. These messages appear in such widely read magazines as the Saturday Evening Post, Liberty, Life, Atlantic Monthly, Harper's, Nation's Business, Newsweek, U.S. News, National Publisher, and Editor & Publisher.

This advertising is part of an even broader campaign by the Bituminous Coal Institute to make friends for the industry and to widen the market for Bituminous Coal. Advertising and publicity directed to the general public is supplemented by special advertisements addressed to home-owners and architects, to industrial users of coal, and to coal dealers and shaped to their special interests.

This public relations campaign, sponsored by mine operators, is part of the unified program for progress within the Bituminous Coal Industry—a program designed to assure the future of every member of the industry. If you are not in on this program, write us today for further information.

BITUMINOUS COAL INSTITUTE

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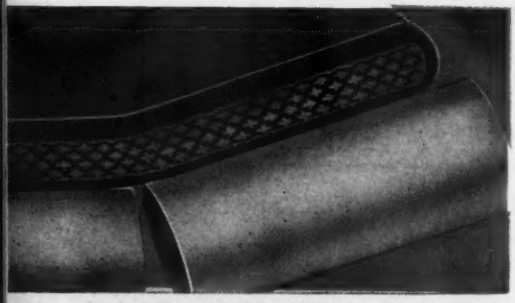
Courtesy of Goodman Manufacturing Company

—a MANHATTAN development that increases tonnage flow from your underground workings



Detail of Homocord Strength Member construction. Open fabric structure permits FLEXLASTICS to penetrate and unite all parts into a homogeneous whole.

ADVANTAGES OF HOMOCORD CONVEYOR BELTS

1. Complete bonding of every member into a homogeneous structure. 2. Holds metal fasteners. 3. Lateral flexibility permits perfect troughing, accurate training, reduces fatigue of flexing at bend in troughing idlers. 4. Resists destructive action of continuous or heavy impact feeding. 5. Cushion Homocord body and low inelastic stretch reduce wear and tear of top cover. 6. Homocord body reduces hazard of punctures. 7. Homocords so completely encased in Flexlastics, moisture not admitted, mildew cannot start. 8. Longer life, lower cost per ton.

Homocord construction, invented and perfected by MANHATTAN engineers, for conveyor belt use only, is the first and only conveyor belt possessing the virtues of a cord belt with the drawbar strength and resistance to fatigue to hold metal fasteners.

Longitudinal Homocord Strength Members, grouped to give great tension strength, are tied together with cross Homocords to allow exceptional troughing for full loading.

These component Strength Members, sealed-in with moisture-proof FLEXLASTICS*, and mildew-proofed for added protection, have a flexible, resilient, rolling contact with each other to provide cushioned resistance for heaviest feed impact and protect the tough wear-resisting cover from abrasion and puncture.

Other brands of MANHATTAN Conveyor Belt for special services are also made with FLEXLASTICS* and specially designed Strength Members to distribute load strains uniformly. Longitudinal and transverse flexibility provides power-economy, traction and easy troughing. Mildew-proofed for underground service, oil-proofed where needed, and compensated to equalize ply-stresses over small pulleys.

*The term FLEXLASTICS is an exclusive MANHATTAN trade mark. Only MANHATTAN can make FLEXLASTICS.

THE MANHATTAN RUBBER MANUFACTURING DIVISION
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JACKBITS

Changing to Jackbits will reward you with greater drilling efficiency and reduced costs. The experiences reported here prove conclusively that Jackbits are the starting point to better drilling.

Increase Tonnage — At one mine Jackbits increased the tonnage per miner's shift approximately 15%.

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Easily Reconditioned — I-R Jackbits are backed by the only complete line of reconditioning equipment. As a result, reconditioning is easy and costs are low.

Let your Ingersoll-Rand branch tell you more about the economies resulting from the use of Jackbits.

15-630

"a lot safer to operate

John Barron, Electrical Superintendent of the Bird Coal Company, Johnstown, Penna., says, "The Westinghouse new Flush-Frame construction provides more space for the operator and equipment. Not only that, but it's a lot safer to operate with the old type projection taken off. Inspection is a cinch and the men are glad to make their periodic check on schedule. There's no doubt in my mind Westinghouse Mine Locomotives are streamlined for operation and inspection."

GETTING OUT THE COAL . . . is of vital importance these days to meet the ever-increasing demand for higher tonnage. Dependable, fast, safe performance of mine locomotives—from face to surface—is more necessary now than ever before.

Westinghouse Mine Locomotives, widely used throughout the industry, have established a reputation for efficiency, trouble-free operation and maximum safety. Designed for easy operation and inspection, they deliver more "on-the-job" haulage . . . with less "time-out" for maintenance and repairs. This means lower operating and maintenance costs.

Westinghouse has had many years of specialized experience in the design, development and manufacture of mine locomotives. For complete information call your closest Westinghouse office or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

WESTINGHOUSE

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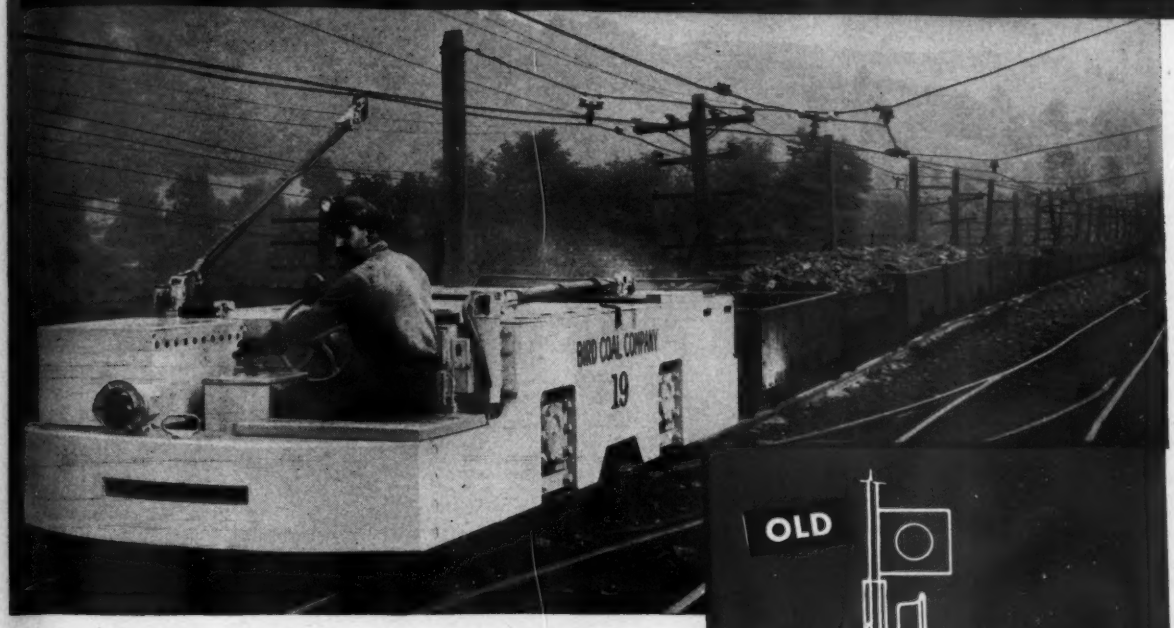
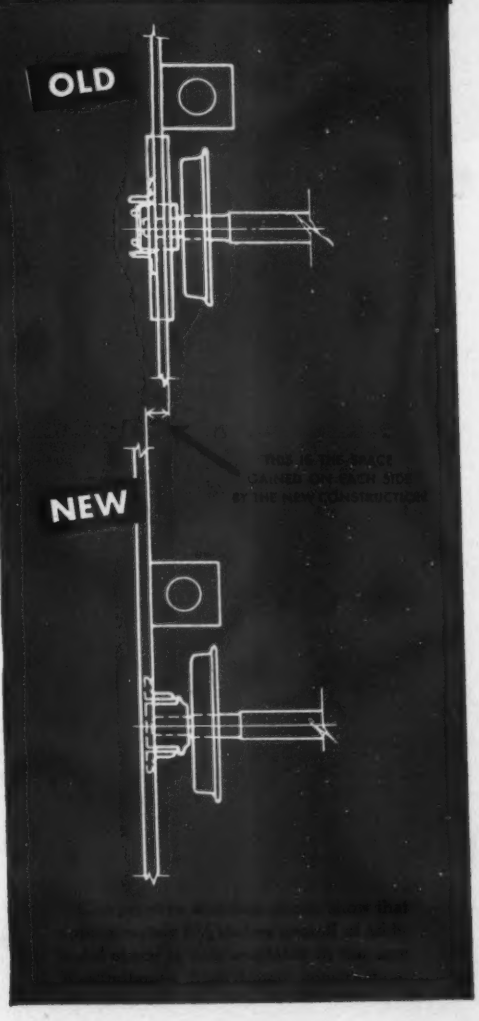
MINE

and inspection is a cinch!"



AT WORK . . . FOR BIRD COAL COMPANY

Westinghouse Mine Locomotives, as illustrated here and on opposite page, are doing a real haulage job for the Bird Coal Company. Because of their practical design, exclusive features and rugged construction, they can be depended upon for years of satisfactory service.



EXTRA SPACE IN NEW FLUSH-TYPE FRAME . . . KEY TO MANY ADVANTAGES

The flush-frame construction of Westinghouse Mine Locomotives provides extra space without increasing the over-all width. In addition to better appearance, the additional space permits a better equipment layout, mechanically and electrically . . . with improved arrangement of cable ducts, more space for removing springs, larger sand boxes and many other advantages. Inspection and maintenance are easier and there is more room for the operator. Old-type projection of journal box beyond the side frames is eliminated, thus reducing the possibility of serious accidents to mining personnel and equipment.

LOCOMOTIVES

[*Page 17*]

SOAKEROO

Like the hide on the amphibious old fellow above, the jacket for U.S. Royal Mining Machine and Locomotive Cables is tough and waterproof. It has to be to give the service mine engineers expect when they specify "U.S. Royal".

We make sure of it by submerging these cords and cables, hour after hour, in a bath that is a real "soakeroo". You could safely use them if your mine was at the bottom of the ocean!

Rough treatment is the rule for a whole series of tests our scientific inspectors make of U.S. Royal Cords and Cables. They are heated, frozen, compressed, stretched, bent. And they have to pass with a mark of 100%. That's why they have all the qualities you need . . . no matter how tough the conditions are at *your* mining property.

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Mining CONGRESS JOURNAL

Published for the Entire Mining Industry by The American Mining Congress
S. A. TRENGOVE, Editor
Volume 31 JUNE, 1945 Number 6

Get Those Gold Mines Going

ONE of these days gold mine closing order L-208 will go by the boards—and American gold miners will heave a great sigh of relief. Set-backs suffered by this industry are tremendous in accrued repairs and pumping charges, loss of stopes and haulageways, and scattering of manpower, totaling damages all out of proportion to the meager benefits obtained via the L-208 mandate. No branch of American industry is more anxious to get back into harness and to take its full and proper place in the world economic picture. We all cry for plentiful postwar employment; so let's put this excellent and certain source of jobs in shape at once, simultaneously preparing to again furnish our share of this important monetary metal. Since it takes some time to re-open mines (some will need a year to get started) further delay can only increase damages and reduce employment potentialities. If we want to be ready when victory comes *now is the time to get the gold mines going!*

Price or PROFIT Controls!

THE necessary production of any commodity in our free American economy is best assured when the profit motive is adequate. Congress, even in the face of war, recognized and incorporated this basic premise in the wording with which it set up the Emergency Price Control Act.

OPA, however, in arriving at its coal-pricing formula based on "average" costs, has leaned far too heavily toward *control of profits as such,* and in so doing has violated one of the basic purposes for which all wartime controls have been established—to assure adequate production of needed commodities. Reverberations ranging from unbelief to indignant disgust are being heard in every coal district in the country.

Failure to permit price increases in keeping with the new coal wage agreement has not only resulted in universal profit cutting but has heavily increased the number of mines operating "in the red." Protests, even in the severest hardship cases, find relief if at all, only after long and trying hearings and after conclusive proof of actual losses. Even then relief is inadequate. The shortcomings of the present OPA price plan are so obvious to coal men as to be classed as ridiculous, if their consequences were not so serious. Labor and management alike are agreed on the harm done to the industry.

Whatever adjustment is made in coal prices, however, must be done on the basis of the full and complete cost and price knowledge of the coal industry, and with proper realization of the injuries already incurred through the curiously erroneous idea of "average" costs. Appalachian Coals, Inc., for instance, has offered a most commendable plan: "basis for the maximum price for coal from a given seam . . . would be . . . actual costs of the highest-cost well-managed producing mine in that seam . . . production of which mine is found necessary in order to assure over-all adequate production. Add a fair and reasonable profit . . . and the proper maximum prices for the coals of that seam . . . are arrived at."

Any fear of inordinately large profits for low-cost mines from such a plan is at once dispelled by what is known of current income and excess profit taxes. The A.C.I. plan is sound and worthy of adoption. It, or something equivalent to it in recognizing fairness in coal prices, should be adopted without delay to assure justice to the coal industry.

Geologists and Victory

NO science has been put to better use during our military operations against the Axis than geology. Through its guidance, assault troops and combat engineers on all fronts have hit their objectives equipped with invaluable knowledge of protective and negotiable terrain, water supply and construction materials. Strategic airfields have sprung quickly into being with the aid of previous thorough knowledge of such items as good wet-weather footing, accessibility of supplies, where and of what to build roads, et cetera.

The Military Geology Unit of the United States Geological Survey, calling upon its vast international file of maps, aerial photographs and other data, has provided answers to the Army's numerous invasion problems involving both surface and subsurface geology, all the way from North Africa to Normandy and the Rhine, and from Guadalcanal to Okinawa.

The Federal and State geological surveys and geologists in general have also contributed extensively to victory through aid in searching for strategic mineral supplies. In fact, their contribution to our mineral well-being began long before the conflict and will continue long after peace. In the main, a thoroughgoing knowledge of the structure and composition of the earth's crust is as basic to our success as a nation as anything we know of.

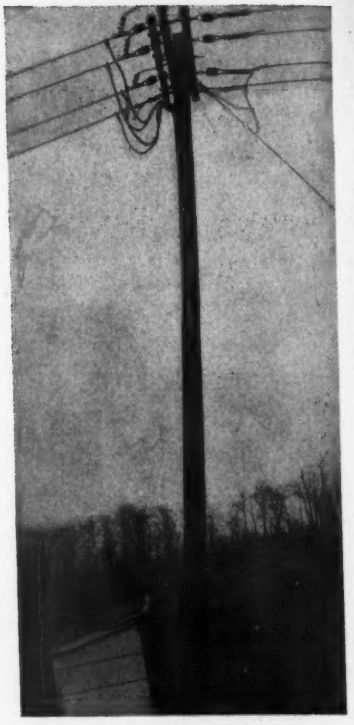
The American mining industry, mindful of its needs in keeping strong ore reserves ahead, looks ever to the geologist to assist in piloting its course. May his knowledge, his techniques and his ingenuity continue to improve to keep us well in the running in providing the minerals and metals which are essential to national strength in peace and in war.

Portable Shovel Switch-Houses

Savings in Operating Time and Important Improvements in Safety for Personnel and Equipment Have Been Obtained Through Use of Portable Switch-Houses

By GEORGE J. REYNOLDS

Chief Electrician
The Jefferson Company



Hot-taps for shovel switch-houses or 2 or 4-door distribution boxes

THE JEFFERSON COMPANY'S power distribution system is built upon the three major precepts of:

Ground-fault protection for personnel.

Adequate protection for machines and cables.

Reduction of delays by immediate location and isolation of faulted unit.

The essentials of the system are a 1,500 kva substation, a 4 wire 4/0 pole line, a flexible system of 2/0 type SH-D feeder cables as laterals to give the required flexibility to take care of day by day changes of power requirements, and individual Shovel Switch-Houses to provide for machine protection and selective tripping. Ground-fault protection is built into this system to give maximum protection to the personnel as one of the basic safety requirements. All 4,160-volt power distribution cables used, both feeder and trail cables, are rubber jacketed type SH-D.

During the early years of operation, Shovel Switch-Houses were not provided and the machines and cables were protected by fused disconnects in the field, and ground-fault and inverse time delay overcurrent relays at the main substation—the overcurrent relays being set to carry the peak mine load. At the time of fault the fuses would blow and the fault would kick out the oil circuit breaker at the substation, thus shutting the mine down with resultant lost operating time for the entire mine.

Savings in Operating Time

A description of the reduction of this lost operating time by the installation of individual portable shovel switch-houses is as follows:

It was noted by survey of past records that considerable lost operating time was attributed to electric power distribution cable faults and cable repairs.

The first step in the reduction of this lost time is the prevention of cable faults. Cable faults can be reduced to a minimum by the proper care of power cables, such as careful handling and the repair of patched and otherwise defective cable by vulcanizing. An educational program was first put into effect instructing mine personnel on the dangers of abusing the cable by improper handling or by running over it with trucks or passenger cars.

The second step is the maintenance of cables. The repair of defective or faulted cable is important and a cable vulcanizing machine is essential. The all important point to stress in cable vulcanizing, is the replacement of the corona shield. It is important, first, from a safety standpoint for the protection of the personnel handling the cable so a fault in the splice will first develop as a ground fault, and secondly, for the protection of the cable itself in the elimination of corona stress at that point, and also the reduction of corona along the conductor's length by the continuation of the corona shielding.

The actual lost time of a cable

This manner of building risers for cable taps has been discontinued in favor of the hot-tap above

fault may be divided into two parts. That of the location and isolation of the faulted cable and its attendant high voltage switching; and the actual changing or repair of the defective cable.

Portable Switch-Houses a Real Help

It is assumed in this paper that the lost time of changing or repair of the defective cable is a fixed element and we shall deal with reduction of lost time of cable fault, due to location and isolation, by the installation of portable shovel switch-houses.

A line diagram of a power distribution system is included, Fig. 1, upon which is shown the high voltage switching required during a ground-fault to the system as per following example:

Assume a line-to-ground fault at point "X" in trail cable of 550-B Shovel. At the instant of occurrence, the main oil circuit breaker at substation "A" opens and eventually after the third reclosure locks itself out.

At this instant every unit supplied by this substation (shown in Fig. 1) is down and cannot resume operation until the oil circuit breaker at "A" is closed manually. This breaker cannot be closed until the fault in the pit cables is located and cleared of the power lines. At that point it is 'cut and try' until the defective section is located. This section can then be isolated and the main oil circuit breaker closed to supply power to the remainder of mine units. This lost time will average from one hour to three, including all units, before the repairs or change of cable is ever started at the individual unit on which the fault occurred.

Lost Time Studies

Table I shows Lost Operating Time due to faulted cable for the mine in 1943 as shown by records of single unit. Operating units consist of 550-B Stripping Shovel and a 52-B Loading Shovel.

Items 2 through 8, Table II, are lost time delays that are not included in Lost Operating Time 550-B, Table I. However, these are lost time delays that occur at the same time and are proportional to the 550-B report as shown in Table II. These items are a totally unnecessary lost time delay and are entirely eliminated by the installation of individual portable shovel switch-houses.

A 9-W dragline was placed in operation March, 1944, and at that time three switch-houses were installed, one for the 550-B, one for the 52-B, and one for the 9-W dragline. These switch-houses were designed and built by our electrical department at a very nominal cost.

TABLE I

LOST OPERATING TIME—550-B

Month	Cable Repair
February	7 Hr. 7 Min.
March	6 Hr. 58 Min.
April	10 Hr. 38 Min.
May	4 Hr. 1 Min.
June	24 Hr. 15 Min.
July	19 Hr. 31 Min.
August	8 Hr. 16 Min.
Total, 7 months.	80 Hr. 46 Min.
Average month .	11 Hr. 52 Min.

TABLE II

LOST OPERATING TIME OF INDIVIDUAL MINE UNITS
BASED UPON RELATION TO LOST TIME OF 550-B DUE TO CABLE REPAIRS

Assume one hour minimum delay from time fault occurs until it is located and its section isolated from mine power system.

Item	Unit	Lost Operating Time
1.	550-B	1 Hr. plus Necessary Time to Repair or Change Cable
2.	52-B plus trucking units	1 Hr.
3.	29-T Drills	1 Hr. each
4.	Sydney Tipple	1 Hr.
5.	Sydney Mine Trucks and Loading Shovel Dependent Upon Tipple Operation	1 Hr.
6.	Betsy Tipple	1 Hr.
7.	Garage	
8.	Machine Shop	1 Hr.

The switch-houses are installed between the shovel trail cables and the main power supply, such as the pole line lateral or its 2/0 power feeder cable, as shown in Fig. 2. The principal of application being to keep the switch-houses as much as possible ahead of the cable that supplies the individual unit. A 50-ft. No. 6 SH-D cable is attached to each switch-house and the switch-house can be either hot-tapped onto pole line or connected to a four-unit distribution box, which is in turn fed by a 2/0 lateral feeder cable and feeds two or three other operating units. The individual switch-house includes a three-gang isolating or disconnect switch and an oil circuit breaker of sufficient interrupting capacity which is operated by IAC relays in conjunction with current transformers of proper size for the individual machine. The relays of the switch-houses and of the main substation are checked and recalibrated by the Ohio Power Company meter department semi-annually in order to provide check as to being O.K. for actual operation.

Extent of Protection Given

The switch-houses are designed to give ground-fault protection, inverse time delay overcurrent protection, instantaneous short-circuit protection and to provide selective tripping.

The selective tripping permits immediate location and isolation of faulted unit, whether machine or cable, without interruption to any other mine unit with the resultant savings of time. At the time of fault, the proper relay operates the oil circuit breaker in the switch-house and opens the circuit between the fault and the mine power supply system. The relays of the main substation are cascaded in time relation to those of the unit switch-houses to give maximum protection to the individual machine and to allow the switch-house oil circuit breaker to trip and clear itself before the oil circuit breaker at the main substation.

Instantaneous ground-fault protection is provided at same value used in main substation relay or minimum value possible. The substation ground-relay setting has a time-delay to enable the portable oil circuit breaker to trip and clear itself first. The ground potential being held to its safe value during this interval by the resistor at the substation limiting the current in the neutral circuit.

Overcurrent protection is provided for the individual machine it is to protect. The relays are set to trip at 125 percent of full load running current with time-delay set to hold the inrush starting current during the time of bringing the motor up to speed.

Short circuit protection for the individual machine is provided by an instantaneous current trip attached to relay that will trip the instant a predetermined current value is reached. This is set at a value slightly higher than that of maximum starting current peak. Such as a 550-B draws approximately 180 amperes peak starting current as shown by ammeter, the instantaneous cur-

rent trip is set at 200 amperes. Thus, eliminating high current values on short circuit conditions and their resultant stress on motor and cable insulation. However, the calculated value of 200 amperes is theoretical and is all right for the initial setting of the relay. When the switch-house is placed in operation the actual current values due to initial surge of starting current is considerably higher and the relay must be adjusted in the field to operating conditions. The trip value is then recalibrated and recorded.

Individual Machine Protection Especially Important Today

The switch-houses besides providing the immediate location and isolation of a fault, provide individual machine protection that cannot be adequately supplied by the common "fused disconnect." This item is increasingly important as the size of the stripping shovels of today increase and their cost and scarcity of replacement parts increase proportionately.

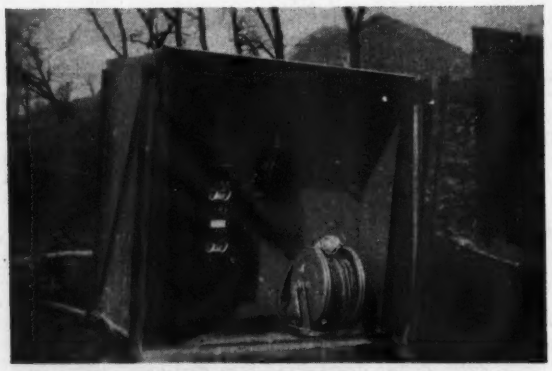
The use of the oil circuit breaker to close the circuit in the switch-house prevents unbalanced voltage conditions or single phase conditions that often cause the loss of an auxiliary unit, such as an air compressor motor or blower motor.

The switch-house eliminates transient surges due to lightning or short-circuit conditions elsewhere on main system affecting the individual machine or cable.

Often, though a system may have excellent ground-fault protection, employing but the one oil circuit breaker at the main substation, dangerous voltage gradients may be obtained at shovel frames because of occurrence of a simultaneous consecutive ground-fault. This is usually caused by the oil circuit breaker at the main substation being automatically reclosed on a faulted cable, thus placing stress upon all the cables and blowing one or more cables that may have been in an already weakened condition. This occurrence is prevented by the opening of the switch-house oil circuit breaker at the instant of the original fault and thus preventing the fault continuing on through the system. This may also occur by the faulting of a second cable at practically the same instant as the first fault developed. The possibility of this occurrence is almost entirely eliminated by the speed of opening of switch-house oil circuit breaker and thus holding the fault stress to a low value.

Double Line-to-Ground Faults

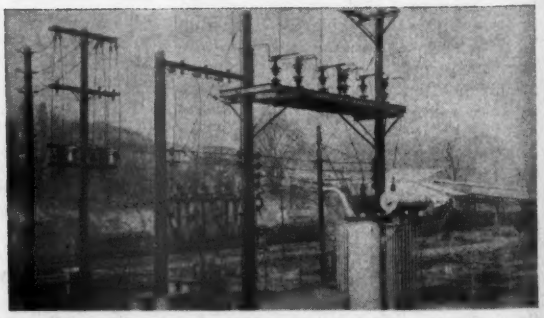
The term "simultaneous consecutive ground-fault" identifies double line-to-ground faults occurring consecutively on two phases, one the result of the other, and continuing simultaneously. A double line-to-ground fault is an extremely dangerous hazard to mine personnel and occurs when two shovel trail cables blow out at the same time. In such a case (two simultaneous consecutive ground-faults at different locations), a line-to-line short circuit results, involving the ground return circuit. The circulating current is limited only by the normal power circuit impedences, this on our system yielding heavy ground currents, of value 650



Front view of switch-house, showing reel with 1,000-ft. extension cord for night trouble shooting. Reel plugs into convenient outlet and cable is dragged out as needed

Portable switch-houses have greatly reduced many operational delays and have improved safety of personnel

Cable sled with 2,000 ft. of cable. Iron junction boxes are used to connect 1,500-ft. lengths. Ground fault protection against fire hazard makes this method of handling practical



Main 1,500 kva substation for the mine power supply

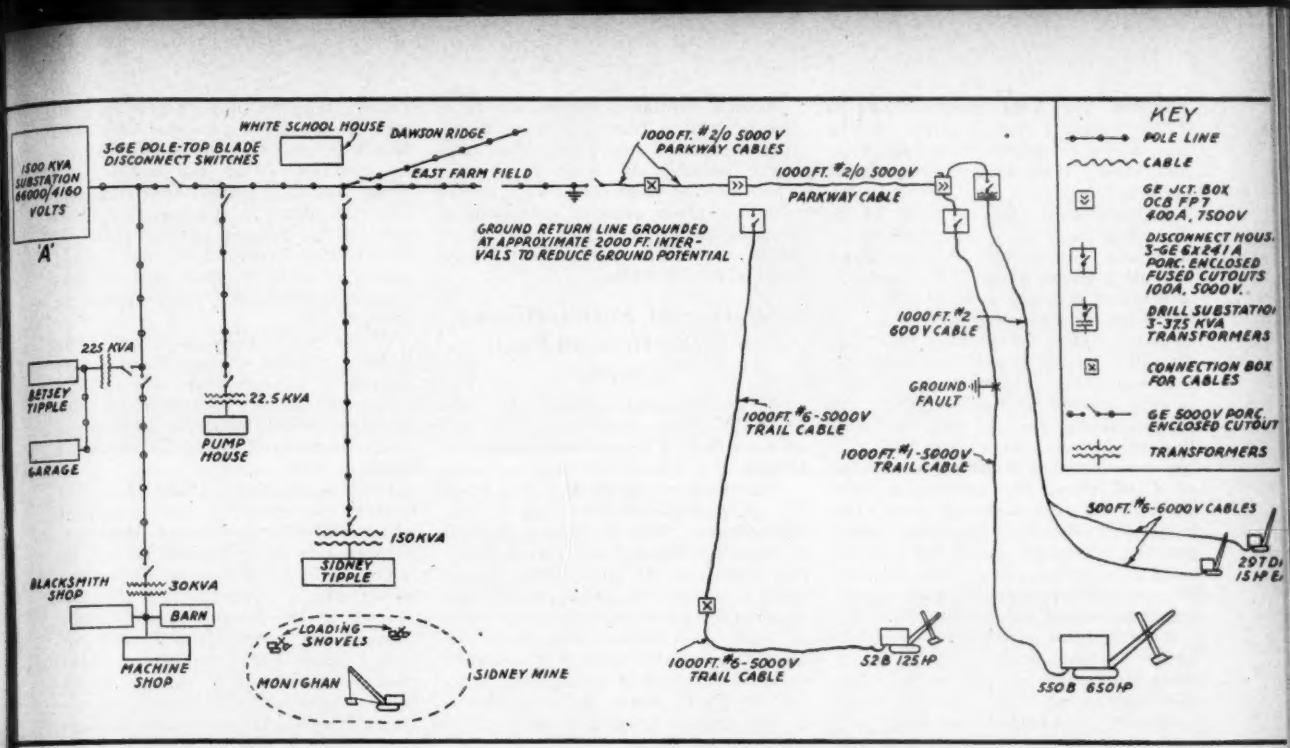


Fig. 1. Line diagram of present 4,160-volt power distribution system

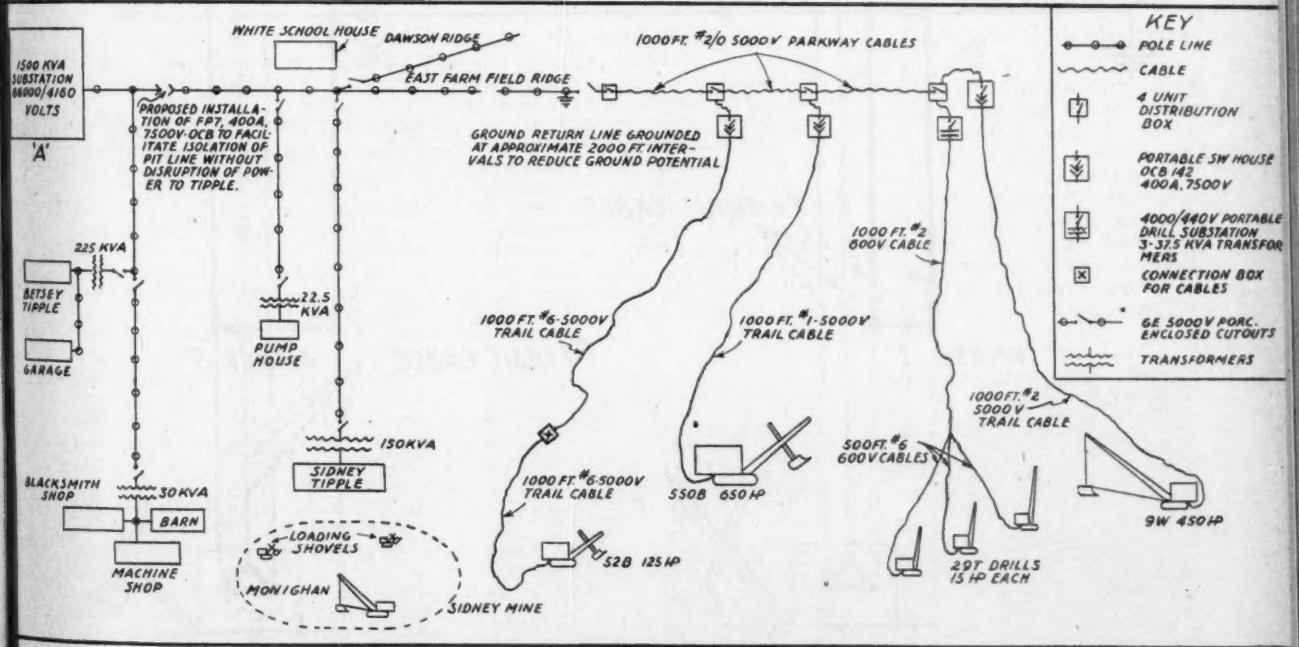


Fig. 2. Line diagram of proposed 4,160-volt power distribution system

amperes for 5-mi. power line, to 1,650 amperes for a 2-mi. power line, and a correspondingly high voltage gradient at each of the shovel frames.

This general characteristic is illustrated in Fig. 3, in which it is assumed that shovel "A" developed a fault between phase I and ground, and simultaneously a fault at shovel "B" occurred between phase 3 and ground. Thus a line-to-line fault circuit has been established involving line conductor 1 at shovel "A," the ground return system between the frames of shovels "A" and "B," and line conductor 3 at shovel "B." In the case of our distribution system of 4,160 volts, the impedence drop through the ground-return system between the substation grounding point and the frame of one of the shovels in fault may be many times that of the maximum permissible safe shovel frame-to-ground potential of 80 volts.

Simultaneous consecutive ground-faults at one given location or in same trail cable do not destroy the effectiveness of the protective arrangement inasmuch as the fault current does not flow through any appreciable length of ground return circuit.

Normal insulation failure is a function of both voltage and time; therefore, a system which provides automatic isolation of the first unit on which a line-to-ground fault occurs will have fewer cases of simultaneous consecutive grounds then a system in which automatic ground-fault isolation is not provided.

Relation of Switch-Houses to Basic Ground-Fault System

A word should perhaps be said about the basic ground-fault system as a whole and as to how the switch-houses are related to it.

The heart of our system is a 1,500 kva three-phase 66,000/4,160 Y volt transformer. The secondary neutral is grounded through a current limiting resistor of 48 ohms which limits system current to 50 amps and the maximum ground potential to 80 volts or less. The ground wire from the secondary of the resistor is carried on insulators out of the substation to the first pole where it is connected to the system ground network of a value of .80 ohms.

The station ground to which the station frame work, lightning arrestor, transformers, fence and oil circuit breakers are grounded and to which also the 66,000-volt skyline is attached, is of the order of 3 ohms and is located approximately 100 yds. away in the opposite direction of the system ground network. The station ground leads are buried directly in the ground between station components and their grounding network.

The object of the separation of the station ground from the system ground is to separate the solidly grounded-neutral operation of the primary circuit from the impedence-grounded-neutral system of the mine circuit.

In the case of the solidly grounded neutral operation the ground current which will flow as a result of a line-to-ground fault on the 66,000 will be limited only by the impedence of the power supply system and the impedence of the ground return circuit between the point of fault and the 66,000-volt substation neutral. If the ground-return system employs earth as a portion of its conductor, an appreciable ground resistance will be encountered at the points of connection and there will be a tendency for concentration of voltage gradients at

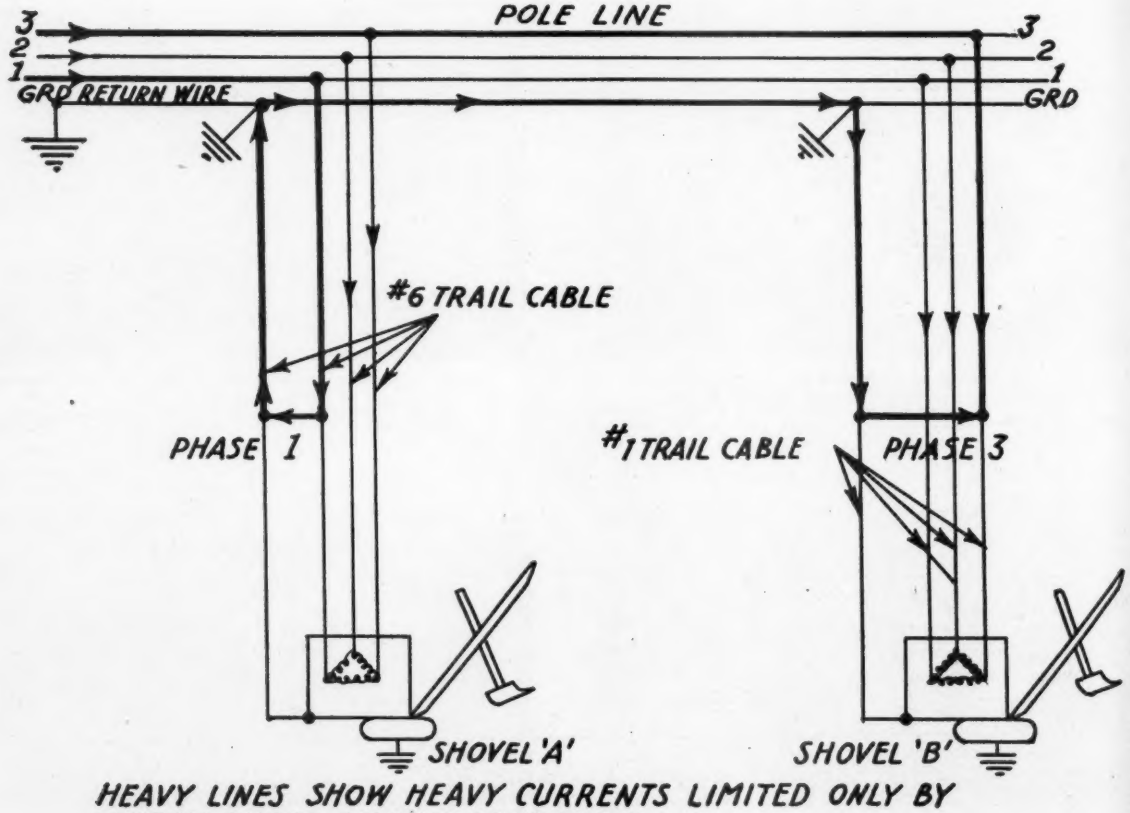
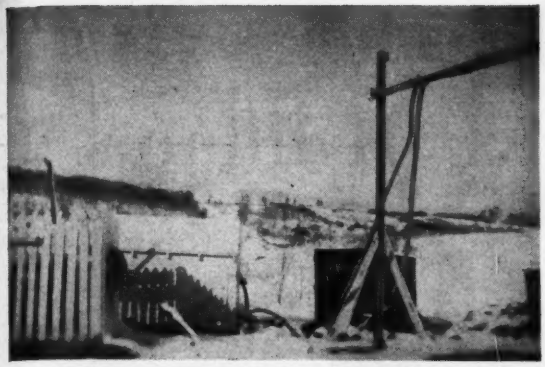
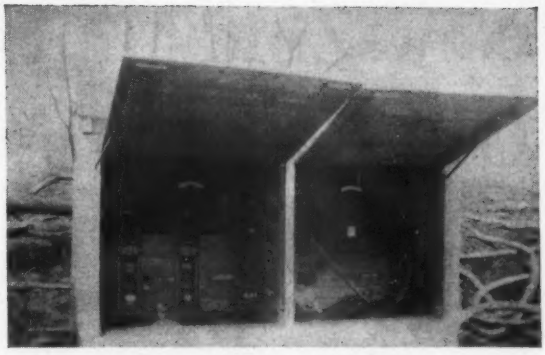


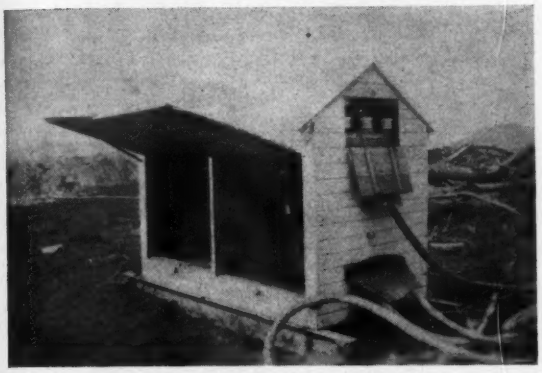
Fig. 3. Simultaneous consecutive ground fault circuit



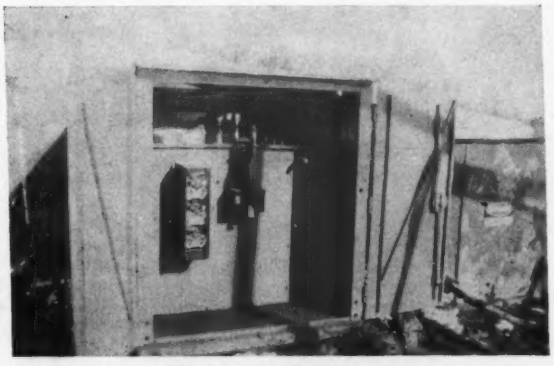
A distribution center with four-door distribution box, drill substation and shovel switch



Four-unit distribution box—side view



A four-unit distribution box—cable end



Realization of switch-house importance is growing as strip-mining increases

the grounding points. This voltage, in turn, will appear at the station components to ground.

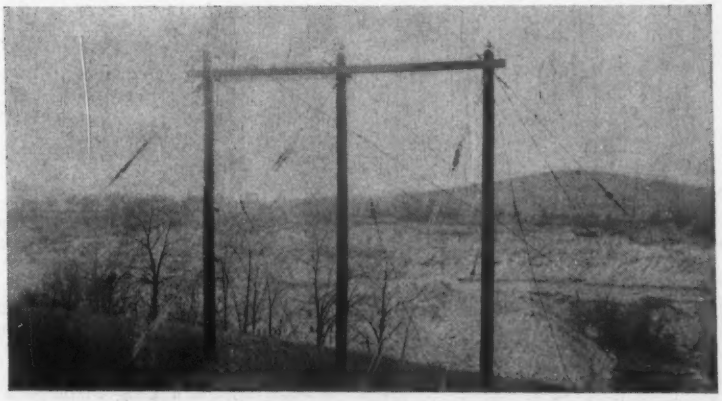
Maximum Ground Current in Solid Line-to-Ground Fault is Completely Controlled

In the impedence-grounded-neutral mine circuit the inter-connection between the earth and the distribution system neutral is made through the current-limiting resistor. The maximum ground current which can flow upon the occurrence of a solid line-to-ground fault is entirely under control, and can be limited to a value between the minimum necessary to provide selective tripping and the maximum allowable safe value. The 50 amperes value selected is sufficiently low to permit a reasonable amount of impedence in the ground return circuit and yet limit the potential difference in the field to the safe value of 80 volts or less.

The substation 4 to 15A IAC ground relay is actuated by a 50/15A current transformer in the neutral circuit between the resistor and transformer neutral. It is set to trip at 99 cycles at 300 percent load or 12 amperes. The .5 to 2.5 A IAC ground relays of the portable switch-houses are calibrated to trip at 18 cycles at their 300 percent load, of 1½ amperes, thus the switch-houses oil circuit breakers tripping and clearing themselves before the substation oil circuit breaker is actuated. Thus the switch-house relays are backed up at all times by the main substation.

Therefore, our present system (that had a very excellent ground-fault protective device basically) is not disturbed by the addition of portable shovel switch-houses but additional protection is enjoyed, as both ground-fault and that of individual machines, and selective tripping is provided.

It is felt that as the strip coal industry grows in eastern Ohio and as the size and number of machines increase, the greater the realization of the importance and the advantages of the switch-houses for individual machines. The industry will realize more and more the importance of a sound ground-fault protective basic system for the individual mine and the installation of shovel switch-houses as an integral part of the system, based upon safety, flexibility and continuity of service.



Supports for 1,000-ft. span of 4 wire 4/0 copper

New Zinc Mines In The Old Galena District Of Illinois

Tri-State Zinc, Inc., of Picher, Okla., has begun mining and milling operations at the Gray mine near Galena, Ill.

Famous Old Lead District Now Supplies Zinc in Important Amounts. Efforts to Build and Bolster Our Engines of War are Exemplified in the New Work of the Ginte and Tri-State Mining Companies

By FRANCIS CHURCH LINCOLN

Mining Engineer
Bureau of Mines, Platteville, Wis.

INDIANS were mining lead from pits in the Galena District when European adventurers first explored the Upper Mississippi Valley. Lead production increased sporadically under French, Spanish, and English influences, but it was not until the influx of American pioneers that a regular lead-mining industry was established. Ten thousand miners thronged the region during the eighteen-twenties, and lead production grew steadily, reaching its peak in 1845. By that time, the Upper Mississippi Valley Region had become the greatest lead-producing region in the United States, and the United States the greatest lead-producing country in the world. Lead mining decreased slowly thereafter, but zinc mining began in 1860 and the zinc production of the area soon became more important than the lead production.

The Galena district is in Jo Daviess County in northwestern Illinois near Galena, a town of 4,000 population nationally famous as the home of General Grant. The town lies on the banks of the Galena River, which in early days was navigable for steamers plying the Mississippi River, but has now diminished to a small creek. The countryside consists of rolling farmlands, rounded hills at times capped with steep rock bluffs, and wooded areas in which deciduous trees predominate. Numerous paved and graveled roads traverse the area, and railway service is provided by the Illinois Central, Burlington, and Chicago and Great Western lines. The rainfall is plentiful, and small streams with numerous branches dissect the region. Adequate water for all mining and milling purposes is obtainable from these streams or may be pumped from the mines themselves. The Interstate Power Company of Galena supplies all necessary power. While the climate is temperate on the whole, temperatures below zero are common in the winter months.

The contributions to Upper Mississippi Valley zinc production made by the Galena district ceased during the nineteen-thirties. The erection of a custom flotation mill in southern Wisconsin, Federal bonuses on zinc and lead, and successful exploratory drilling by the Federal Bureau of Mines have revived mining in the old Galena district, which now appears

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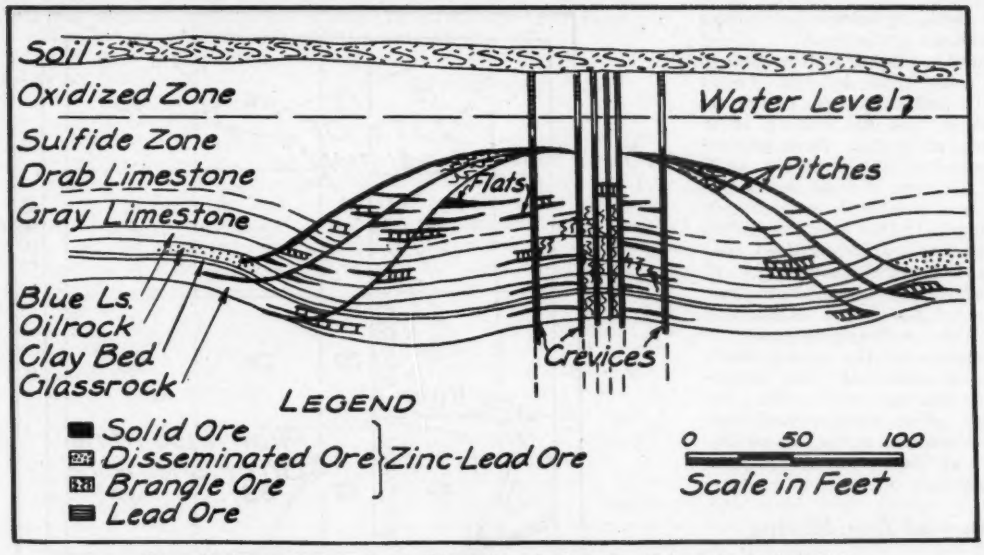


Generalized cross-section of a double-pitch orebody in the Galena zinc-lead district

to be entering upon the largest zinc production in its history. The Ginte mine north of Galena has been producing zinc ore during the past year at a rate of 150 tons or more a day; and Tri-State Zinc, Inc., has leased the Gray property south of Galena (recently drilled by the Bureau of Mines), sunk a shaft upon it, and erected a 600-ton flotation mill which is just beginning to operate.

History of Lead Mining

French explorers learned of the lead mines of the Upper Mississippi Valley from the Sioux Indians as early as 1658, and the Indian mines near Galena are shown on Hennepin's map of 1687.[1] Nicolas Perrot, who established a trading post on the Mississippi River opposite the present site of Dubuque in 1690, was probably the first white man to visit the mines. LeSueur explored the region in 1701 and named what is now called the Galena River the "River of Mines." The district was included in the notorious wildcat promotion of 1717 known as the "Mississippi Bubble." In 1721, Renault brought 200 miners and 500 slaves—the first slaves in Illinois—into the district to exploit the mines, but finding neither gold nor silver soon abandoned the enterprise.[2]

The first American settlers were John and Tyler Armstrong who built a cabin on the present site of Galena in 1818. The Sac and Fox Indians took them to the Buck mine north of Galena where they found that the Indians had penetrated the ground to a depth of 100 feet and were hauling up earth and ore in sacks made of deerskins. When hard rock was encountered, the squaws built fires against it and cracked it by dousing with water. In earlier times Indian mining had been conducted with the aid of sharpened sticks and buckhorn prongs, but at this period the Indians were using hoes, shovels, picks, axes, and crowbars supplied by the whites. Lead was extracted from the ore in crude furnaces of which some

Drilling on the Bautsch farm by the U. S. Bureau of Mines has already disclosed nearly a million tons of measured and indicated ore

20 were being operated by Indians in the vicinity of Galena.[3]

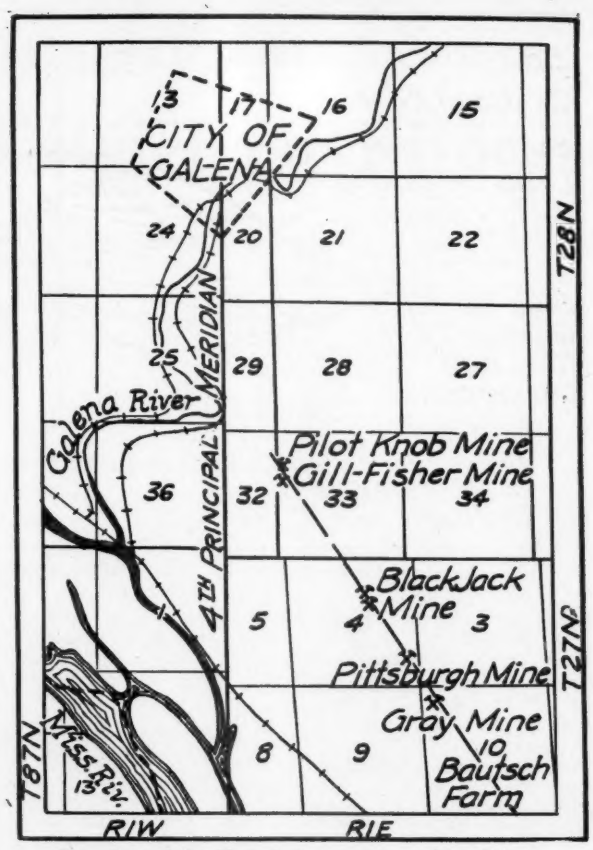
Systematic mining in the Galena district was begun by Col. James Johnson in 1823. A rush to the region ensued, and the mining population rose to 10,000. Lead production reached a maximum in 1845, when 27,250 tons of lead worth $1,600,000 was produced and shipped from Galena. In that year the United States was the principal lead producer in the world, and about 90 percent of its production came from the mines of the Upper Mississippi Valley. After reaching its peak, the lead production of the region slowly declined but continued to be of national importance until after the Civil War. The recent small lead production credited to the Galena district has been obtained as a byproduct of zinc mining.

History of Zinc Mining

The presence of zinc minerals in the mines of the Upper Mississippi Valley was known as early as 1839, but there was no local market for zinc ore until 1859 when a zinc smelter went into operation at La-Salle, Ill., and a zinc oxide plant was built at Mineral Point, Wis. Zinc mining thrived in the area and by 1909 the total production of zinc ore had exceeded that of lead ore.[4]

The Black Jack mine in the Galena district has produced more zinc ore than any other mine in the Upper Mississippi Valley region, being credited with an output of more than a million and a half tons.[5] The mine is 4 miles by road south of Galena on the same "range," or trend of ore deposition, as the Pilot Knob mine, the Gill-Fisher mine, the Pittsburg mine, the Gray mine, and the Bautsch farm now being drilled by the Bureau of Mines. From the Pilot Knob mine to the Bautsch ore body is a distance of 3 miles and the Black Jack is at the center of this range. Stephen Marsden discovered the Black Jack in 1854 and worked it for lead until 1860, since which time it has been worked mainly for zinc. The Illinois Zinc Company of Peru operated the property from 1877 to 1883, the Marsden-Black Jack Mining Company from 1907 to 1908, and the Mineral Point Zinc Company from 1913 to 1920 and from 1923 to 1927. The maximum production of zinc ore in the Galena district was in 1918.

No zinc was produced in Illinois from 1931 to 1938, inclusive. In the last year, the Vinegar Hill Zinc Company erected a custom-flotation mill at Cuba City, southwestern Wisconsin, to stimulate zinc production in the Upper Mississippi Valley. The old Blewett mine was reopened in 1940 and produced a little zinc during that and the following year. The



The mines of the Black Jack range are a short distance south of Galena

Gill Brothers of Galena reopened the old Hughlett and Gray mine in 1941 and later reopened the neighboring North and South Unity mines. Ore from all of these mines was shipped to the new custom-flotation plant at Cuba City. Zinc production was further stimulated in 1942 by government premium payments on overquota outputs of zinc and lead. In 1943 the Ginte mine went into operation, and the Bureau of Mines began drilling the Gray property.

Description of Ore Deposits

The ore deposits of the Galena district are enclosed in dolomites, limestones, and shales of Ordovician age. The ore minerals are sphalerite and galena. The gangue consists of pyrite, marcasite, calcite, and other gangue minerals of minor importance, with some country rock.

Ore and gangue minerals are distributed in three different ways—in solid bodies, in breccias, and in disseminated deposits. Solid ore is in the form of highly mineralized tabular masses occurring in what are locally known as crevices, pitches, flats, and sheets. Crevices are vertical veins from a fraction of an inch to several feet in width and from a few feet to a few miles in length. The larger crevices may extend to considerable depths. A pitch is an inclined vein similar in width to a crevice but of more limited vertical extent, ranging downward from a few feet to a hundred. Pitches flatten and pinch out both at tops and bottoms. Flats are small, nearly horizontal bodies that parallel the stratification of the country rock. They branch out irregularly for short distances from the sides of crevices and from the sides, tops, and toes of pitches. Sheet ore is a term applied to flats of considerable extent, whose connection with pitches or crevices is often obscure.

Breccia ore is locally known as "brangle ore." The ore and gangue minerals of this type of ore enclose brecciated fragments of country rock and at times appear to be brecciated themselves. Sometimes the fragments of country rock are partly or entirely leached out, leaving irregular cavities in the mixture of ore and gangue minerals. Brangle ore is found mainly between crevices and between pitches.

Disseminated ore is composed of scattered crystals and crystal groups of ore and gangue minerals occurring

in layers parallel to the stratification. It usually extends outward from the toes of pitches into the limestone known locally as "oilrock."

The different types of ore frequently occur in combinations. The ore bodies at the Black Jack mine, the Ginte mine, and perhaps also the Gray mine are of the combination type known as a "double-pitch" ore body. Such an ore body consists of two groups of pitches close together but having opposite dips, with vertical crevices between the two groups of pitches. Solid ore in crevices, pitches, and flats, brangle ore between crevices and between pitches, and disseminated ore in the oilrock may all be present in a double-pitch deposit.

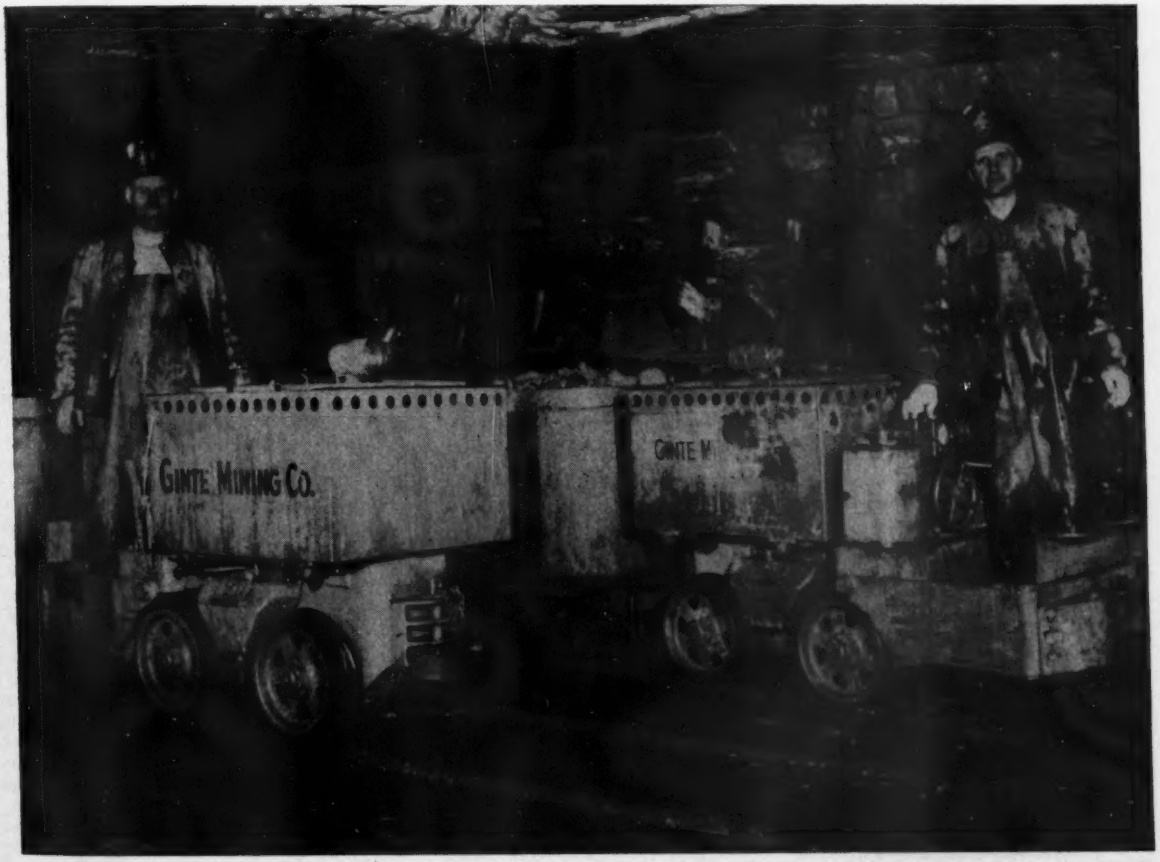
In some cases, only the material in the pitches and in the immediate vicinity contains a sufficient percentage of zinc to constitute ore. In others, the ground between the two sets of pitches, which is locally called "core ground," may be so thoroughly mineralized with zinc that the two sets of pitches and the core ground between them may all be mined economically. Occasionally, when the core ground is not rich enough to mine as a whole, certain flats or groups of flats in it may be profitably extracted.

Ginte Mining Co.

The Ginte mine is 5 miles by road north of Galena. In 1943 the Ginte Mining Company opened the Ginte mine and reopened the old Graham mine, which adjoins the Ginte on the north. From September, 1943, to March, 1944, crude zinc ore was shipped from the property to the Vinegar Hill Zinc Company custom-flotation plant at Cuba City, Wis. Meanwhile, the Ginte Mining Company constructed and placed in operation a jig mill with a daily capacity of 400 tons. Shipment of zinc and lead concentrate from this mill to Cuba City was begun in November, 1943, and still continues.

Mining methods employed at the Ginte mine depend upon the thickness of the ore encountered. Thin ore is mined by simple breast stoping. Two raises have recently been completed from the mine floor to two different heights, at which flats of ore occur which will be extracted by breast stoping. Thick ore is mined by the heading-and-bench method. A heading 7 ft. in height is carried at the top of the ore, and the ore below the heading is broken by flat lifter holes drilled at floor level. In the case of high benches, such as the 20-ft. bench at present being mined, the lifter holes are supplemented by flat splitter holes drilled halfway up the bench. Pillars are left for support where necessary.

Drilling is performed with Chicago Pneumatic rock drills, which are supplied with air at 100 lbs. pressure from either of two available compressors, a Chicago Pneumatic 8-drill compressor or an Ingersoll-Rand 5-drill compressor. Seven jackhammers and two stopers are in use. Three of the jackhammers are mounted, one is supported by a pneumatic piston or "jack-leg," and three are held up by homemade supports known as "old men." An old man consists of a 2- by 6-in. plank with two steel floor prongs at one end and steel hooks at half-foot intervals on one face. The prongs of the old man are placed on a plank on the floor, and the handle of the jackhammer is hung on the hook nearest the desired drilling height. Drill steel is the 7/8-in. conventional type. Dupont Gelex No. 2 dynamite is in general use, while Hercules 60 per-



Mancha storage battery locomotives haul the ore cars at Ginte mine. The mine is five miles north of Galena

cent is occasionally employed in difficult ground. Fuse firing is customary except when ground is very wet. The powder consumption is 0.8 lb. a ton of ore mined.

When the heading-and-bench method of mining is employed, the broken ore is dragged from the face by means of a Holcomb scraper operated by a 25-h.p., crawler-mounted, Sullivan 3-drum scraper hoist. The ore is scraped directly into buckets, locally called "cans," which are 30 in. in diameter and 30 inches deep and hold about 1,400 lbs. of ore. The cans are supported on ground cars and hauled to and from the shaft in trains of 8 or 10 cars by 2 Mancha Type-B storage-battery locomotives. The track is 24-in. gage, and the ties are of 2- by 6-in. and 3- by 6-inch oak. A 15-h.p. Ingersoll-Rand 3-drum scraper hoist moves broken ore in breast stopes. A 75-h.p. single-drum English Iron Works hoist is used in the 200-ft. shaft. Two pumps are installed in the mine, only one of which operates at a time. They are a 150-h.p. Layne & Bowler 5-stage turbine with 12-in. column pipe working through a 26-in. drill hole and a 100-h.p. Allis-Chalmers 5- by 6-in. centrifugal with 8-in. column pipe in an 18-inch drill hole. Ventilation is supplied by four high-speed Coppus blowers connected with drill holes. Wires for electric lighting are also introduced through drill holes. Electricity at 220 volts is utilized for mine power.

The Ginte jig mill is of the type common to the Upper Mississippi Valley zinc-lead mines. The motive power distribution is patterned after the early steam-power mills, the entire mill being driven by one 100-h.p. electric motor with the help of numerous shafts, pulleys, and belts. The mill has a capacity of 400 tons each 24 hours but is operated only one shift a day at present. The flow sheet of the mill is shown in Fig. 1.

During the 13 months from September, 1943, through September, 1944, 63,022 tons of zinc ore were mined by the Ginte Mining Company. Of this amount, 9,105 tons averaging 7.67 percent zinc was shipped without being milled. The remaining 53,917 tons was concentrated at a ratio of 7:1 in the jig mill, producing 7,651 tons of concentrate averaging 21.03 percent zinc and 0.71 percent lead. The efficiency was about 70 percent.

W. B. Baggaley is general manager of the Ginte Mining Company and J. M. Van Matre is superintendent. There are 41 persons on the company pay roll, including 4 in the office and 3 in the mill. Mining 63,022 tons of ore cost $2.37 a ton, milling 53,917 tons of this ore cost $0.288 a ton milled, while other costs connected with the operation of the property amounted to $0.802 a ton mined. The total cost of the whole

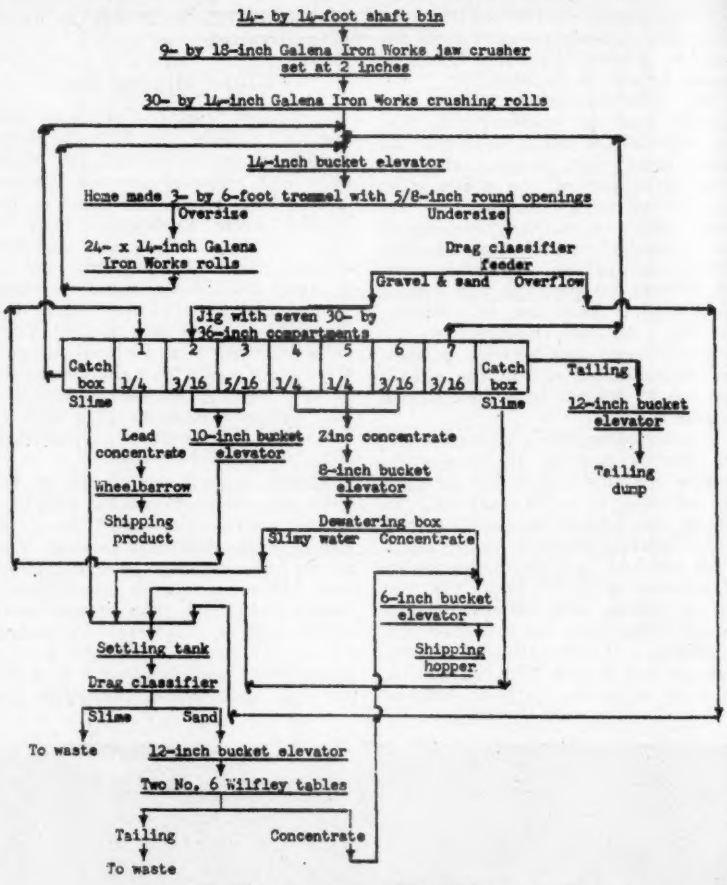


Fig. 1. Flow sheet for Ginte mine's 400-ton capacity jig mill

operation was $3.42 a ton of ore mined, which was made up of $1.74 for labor, $0.99 for material, and $0.69 for other costs. A total of 2,301 tons of zinc was produced at a cost of 4.7 cents a pound, excluding depreciation and taxes. Approximately 84 tons of lead were also produced. If the value of this lead were deducted from the cost of zinc production, the cost a pound of producing zinc would be lower.

Bureau of Mines Exploration in the District

The Gray farm, owned by Judge H. L. Heer, is 5 miles by road south of Galena. Systematic exploratory drilling for zinc ore was conducted on the property by the Bureau of Mines from January, 1943, to June, 1944. Before this, a few drill holes had been put down on the farm by the New Jersey Zinc Company, by the Gill Brothers, by Roland J. Teske, and by Judge Heer, but no mining operations had ensued.

The Bureau of Mines drilled 47 churn-drill holes under contracts with O. E. DeWitt, D. R. Gille, and Guy Peterson and 10 diamond-drill holes under contract with the E. J. Longyear Company. Supervision, surveying, and sampling were conducted by Bureau of Mines personnel. In all, 12,298 ft. of 6-in. churn-drill holes, and 2,166 ft. of diamond-drill holes were drilled. Most of the diamond drilling was for core 1⅛ in. (AX) in diameter, but in some cases ⅞-in. (EX) core or 1 5/8-in. (BX) core was taken. This exploration disclosed an estimated 479,500 tons of measured and indicated ore containing 4.3 percent zinc and a little lead.

The Bautsch farm adjoins the Gray farm on the south. There were no previously reported drill holes on the Bautsch property as there had been on the Gray, nor were there any old shafts or other mine workings. A preliminary study disclosed promising possibilities, and 15 churn-drill holes and 11 diamond-drill holes have been completed by the Bureau of Mines to date. This drilling has disclosed more than 916,500 tons of measured and indicated ore. Drilling is still in progress (January, 1945), and the full extent of the ore body is unknown. It is possible that the Gray and Bautsch ore bodies are

connected over a distance of 1,170 ft. between the southernmost orehole on the Gray ore body and the northernmost one on the Bautsch. One churn drill is now operating on the Bautsch ore body under contract with H. A. Butler and one diamond drill under contract with the E. J. Longyear Company.

Tri-State's Gray Mine

The large deposit of zinc ore disclosed by the Bureau of Mines drilling on the Gray farm was called to the attention of Tri-State Zinc, Inc., of Picher, Okla., by W. B. Baggaley. Tri-State secured a lease on the property, sunk a shaft, erected a mill, and has begun to mine and mill the ore. M. H. Loveman, manager, and V. C. Allen, general superintendent, of Tri-State Zinc, Inc., have spent much time at the Gray mine recently. J. E. Kaltenbach is the local superintendent.

The Tri-State shaft is west of the northern part of the drilled ground. It is 6 by 12 ft. with a concrete collar, and has been sunk to a depth of 200 ft. A shaft station has been established at a depth of 197 ft., and curved drifts have been run from it northeasterly and southeasterly into the ore body. Breast stopes have been opened at the end of these drifts and mining is in progress.

To handle the water while sinking the Gray shaft, four pumps were installed, an 8-in. Peerless with 150-h.p. motor, a 10-in. Peerless with 150-h.p. motor, a 12-in. Pomona with 125-h.p. motor, and an 8-in. Pomona sinker with a 75-h.p. motor. Only the 12-in. Pomona pump is in present use, but a trip down the Gray shaft is still in the nature of an adventure. Dropped rapidly down the shaft in a bucket without guides or bonnet, the visitor is just beginning to experience relief as the speed is slackened on nearing the bottom when he is suddenly plunged into a stream of a thousand gallons of water a minute spurting inward from the sides of the shaft and remains immersed in this waterfall until the bucket touches bottom and he can dive through the cataract to the shaft station. Water does serve one useful purpose in the mine, however, for the water dropping down a churn-drill hole entraps so much air that it provides all the ventilation required at present.

Drilling for blasting is done with 8-S45W Gardner-Denver jackhammers. The ore is loaded with an Eimco-Finlay 12B mucking machine, which will be supplemented later by 25-h.p. Ingersoll-Rand and Sullivan scraper hoists drawing 48-in. Rogers scrapers. The ore is transported in 32- by 30-in. buckets on anti-friction bearing ground cars to the shaft where it is raised by a 75-h.p. Little Giant hoist.

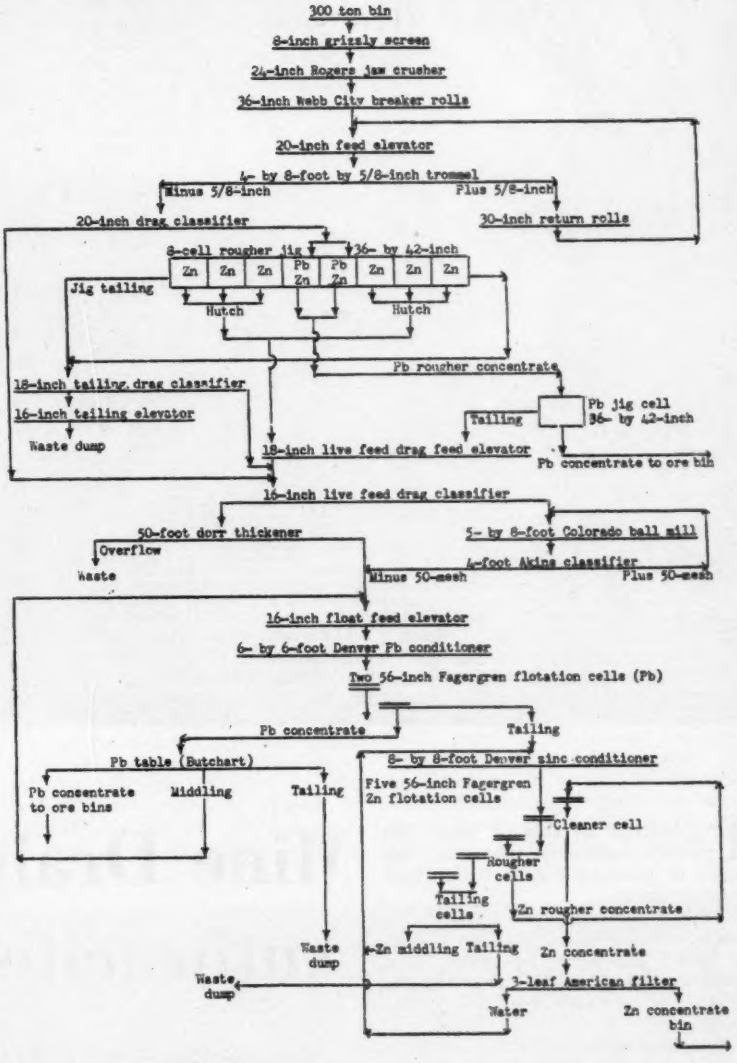


Fig. 2. The Gray mill flow sheet is laid out for flotation of zinc and lead concentrates with a 24-hour capacity of 600 tons

The Gray mill has a capacity of 600 tons of ore each 24 hours. It is a zinc-lead flotation mill of the type common to the Mississippi Valley. The flow sheet is shown in Figure 2. Electric power at 440 volts is utilized in both mine and mill.

The success attending these drilling and mining operations in the Galena district has attracted the attention of mining men throughout the country, and further important developments are expected in the near future.

[1] Bain, H. Foster, Zinc and Lead Deposits of the Upper Mississippi Valley: Department of the Interior Geological Survey, Bulletin 294, 1906, pp. 2-10, 71-119, 142-8.

[2] Schockel, Bernard H., History of Development of Jo Daviess County: Ill. Geological Survey Bulletin 26, 1916, pp. 179-202.

[3] Federal Writers Project (Illinois), WPA, "Galena Guide," 1937; American Guide Series.

[4] Cox, G. H., Lead and Zinc Deposits of Northwestern Illinois: Ill. Geological Survey Bulletin 21, 1914, pp. 12-15, 49-62.

[5] Terry, Owen W., "Black Jack Group, Jo Daviess County, Illinois," War Minerals Report, Department of Interior Bureau of Mines, May, 1943. Unpublished.

General view of 90-inch flume, Warrior Run.

Mine Drainage in the Anthracite Region

Water Has Become One of the Most Serious Problems of Anthracite Mining and Large Expenditures Are Being Made to Insure Future Production

By GEORGE A. ROOS

General Manager
Philadelphia & Reading Coal & Iron Company

IT CANNOT be said of those who produce anthracite that they talk much of pumping but do little about mine drainage.

The anthracite industry, during 1944, produced 64,112,589 tons of coal, of which 42,659,489 tons came from underground mines. Of the 78,145 employes, 51,887 are employed underground.

The anthracite industry has been talked of as being able to last for another century, but if the water record of the past century continues, this expectation of many years production still to come out of the remaining reserves will not be attained. The industry will be a submerged one in fact as well as name.

During the years, the region's rainfall has not altered, but the quantity going inside the mines due to breaks in the surface has increased materially, as indicated by the ratio of tons of water pumped to tons of coal produced underground. This ratio has increased from about 8 to 1 in 1920 to 30.3 to 1 in 1942 at some collieries producing a very large tonnage. For the region as a whole, the ratio of tons of water pumped to tons of coal produced underground is about 13.2 to 1.

It can be stated that the chief factor that threatens to cut short the life of the anthracite industry is the encroachment of mine water, which progressively floods the mines, threatens to destroy anthracite reserves and seriously affects the whole economy of the anthracite industry.

Mine Water Problems

The amount of surface and mine water handled in the production of anthracite is an astronomical figure. During 1943, three anthracite mining companies pumped 89 billion gallons of water at a cost of about 4 million dollars for underground pumping alone. During 1944, about 150 billion gallons of water were pumped to the surface from underground mines at a cost of about 9 million dollars. These operations produced about 43 million tons of coal. In addition, 50 billion gallons of water were handled by water-level drainage tunnels and water-diversion surface flumes. The cost of this phase of the mine drainage, dewatering of flooded mines, and dam construction is about $1,000,000 annually. Summarizing these figures,

some 200 billion gallons of water are being handled, costing $10,000,000 annually to produce the Nation's anthracite.

Not all mine water serves no useful purpose. A rough estimate indicates that for each ton of coal mined underground, about 1,100 gallons of water are pumped to the surface for coal-preparation purposes.

The anthracite mine-drainage problem is complex. Companies are often operating within widely separated areas menaced by excess water infiltration. Barrier pillars between mines are often punctured or are not strong enough to withstand the pressure to which they are exposed if the water is not controlled. One company refuses to join its neighbors in an attempt to control infiltration, whether from surface waters, underground pools, or water flowing through mine workings, because: (1) its mine has been abandoned, (2) is approaching exhaustion, (3) such cooperation is not necessary as long as the other companies must handle the water, (4) it is financially unable to contribute, and (5) an imposition of the expense of controlling infiltration will force it out of business and it may as well wait until it is driven out by the burden of pumping. The policy of acting as individuals rather than as a group for the common good contributes to the collapse of one operation after another, often with the abandoning of workings developed at enormous expense, because it is unsafe to work adjacent to a flooded mine or it is financially impossible to assume the burden of pumping abandoned mines. Finally, the few remaining companies are faced with the whole burden which they finally are unable to assume because of the enormity of its financial requirements.

Seepage and Underground Pools

In the past, mining practices have allowed surface water to enter mine workings now abandoned and to infiltrate into mines now in operation, whence it must be handled from lower levels by active mines already burdened with the water normally found in them. As more mines are abandoned, the problem becomes cumulatively more serious. Some idea of the extent of flooded or partly flooded areas is obtained when it is realized that over 30 billion gallons of water are impounded in underground pools.

Not much is known about barrier-pillar seepage under heavy adjoining water heads. Water pools in the anthracite region are too recent to have developed much data on this question. Data from England, where water pools of the same character have been under observation for many years, indicate 500 g. p. m. at heads over 300 ft., where the barrier pillar is ample against calculated water pressure. In one instance in the Pennsylvania anthracite region, it has been observed that seepage up to 365 g. p. m. occurs under a head of about 570 feet of water against an ample barrier pillar which is intact.

Other than the useful knowledge that such seepage adds to the average inflow on a property, there is nothing that can be done about it as long as the water is impounded underground.

Potential danger zones in anthracite mining are the areas where the rivers and creeks cross or run lengthwise over the coal basins. In the Wyoming region from Pittston to Nanticoke is present the so-called "buried valley" or ancient stream bed of the Susquehanna River, which has carved itself a new bed after having filled the old one with sand, gravel, and quicksand, which are highly waterbearing and very irregular in course and depth. Mines working under or adjacent to this "buried valley" must spend large sums of money in drilling numerous boreholes in order to establish definitely and accurately the course and extent of this water-soaked "river wash," so that a safe rock cover varying from 30 to 80 ft. thick may be maintained, beyond which no mining will be permitted.

Pumping Practices

Since anthracite mining began in 1807, pumping equipment has progressively improved in efficiency and arrangement in order to cope with water difficulties. Single-piston steam pumps have been used in the anthracite fields since 1868. From 1897 to

Inside view of 90-inch flume—capacity 100,000 gal. per min.

1908 large compound duplex- and triplex-expansion steam pumps were installed in main pumping stations at most anthracite collieries. Most of these pumps have been replaced with larger-capacity modern centrifugal units and were scrapped from 1928 to 1934. The average life of installation was approximately 29 years; however, some of the steam pumps at two large collieries are still in place and are being used as active and standby units.

Numerous small steam- and air-driven pumps were used as gathering units from 1897 to 1910, when they were gradually replaced by electrically driven single, duplex, and triplex piston pumps. About 1930, small automatic starting-and-stopping centrifugal units made their appearance and are gradually replacing the piston pump.

Electric motor-driven vertical quintuplex and horizontal triplex pumps were installed as main pumping units during the years 1917 to 1920. The quintuplex pumps were huge pieces of equipment requiring large pump rooms and were expensive to maintain. Modern high-head centrifugal pumps have replaced quintuplex and triplex piston pumps as active pumping units.

The centrifugal pump was first used generally about 1906, and until 1920 was installed mostly with low-head characteristics. Beginning in 1920, high-head, large-capacity centrifugal pumps have been exclusively installed in all major pumping stations.

A more recent development is the use of deepwell pumps installed on the surface or underground for controlling water impounded in flooded mines; or installed underground to handle water in active mines where inside slopes, previously sunk below a level established by a grade drainage system, have created a condition where individual pumping plants, previously established at the inside slopes, have insufficient sump room.

Inside view of concrete intake for surface water diversion flume

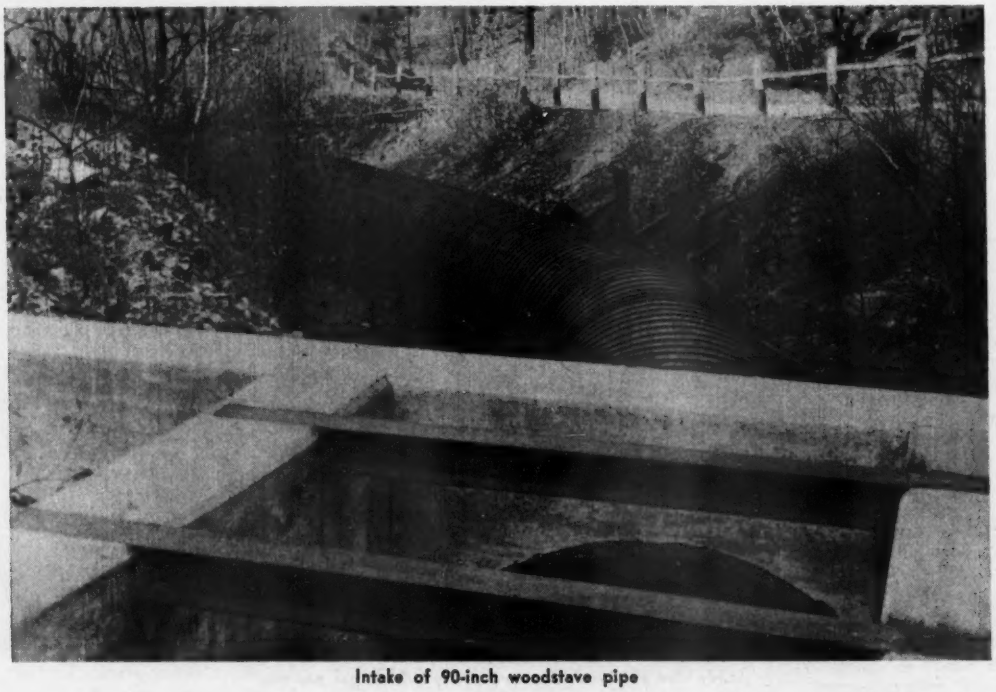
Drainage Tunnels

Drainage tunnels form an important link in anthracite mine drainage. In instances, costly pumping of water from active or abandoned mine workings has been circumvented by the use of drainage tunnels. They are applicable, however, only where coal basins lie for the most part above the natural drainage horizon of the surrounding surface. Such conditions exist generally in the Middle Anthracite Field, where most of the coal measures lie at an elevation about 1,000 feet above sea level and slightly higher than nearby valleys. It is here we find the widest application of drainage tunnels. In the other anthracite-producing fields the coal measures lie as much as 2,000 feet below the natural drainage level of the surface.

Drainage tunnels are advantageous for large quantities of water to be handled over a long economic life of a mine. Their upkeep is comparatively light, but the initial cost is high.

There is no doubt that, given the

(*Continued on page* 50)



Intake of 90-inch woodstave pipe

Mine-Ventilation Safety Door

Anaconda's Steward Mine Safety Door Has Been Designed to Suit Local Requirements and Is Meeting Them Satisfactorily

By EDWARD F. COURTNEY
Mining Engineer, U.S.B.M.
and
JOHN A. JOHNSON
Engineer in Charge, Health and Safety Branch, U.S.B.M., Butte, Mont.

THE accident records for the Butte mines of the Anaconda Copper Mining Company, Butte, Mont., show that fatalities and numerous serious accidents have resulted when underground locomotives and ore trains crashed through ventilation doors. As a consequence, many types of ventilation doors have been designed and tested. In addition to other requirements that must be met incident to their operation, satisfactory ventilation doors should embody safety features. Doors that are believed to fulfill these requirements have been in use at the Steward mine of the Anaconda Copper Mining Company since February 4, 1943.

Construction

The Steward mine safety door can be built to suit local conditions. The door and doorframe are built of wood according to standard specifications to suit conditions in the Anaconda Copper Mining Company mines at Butte.

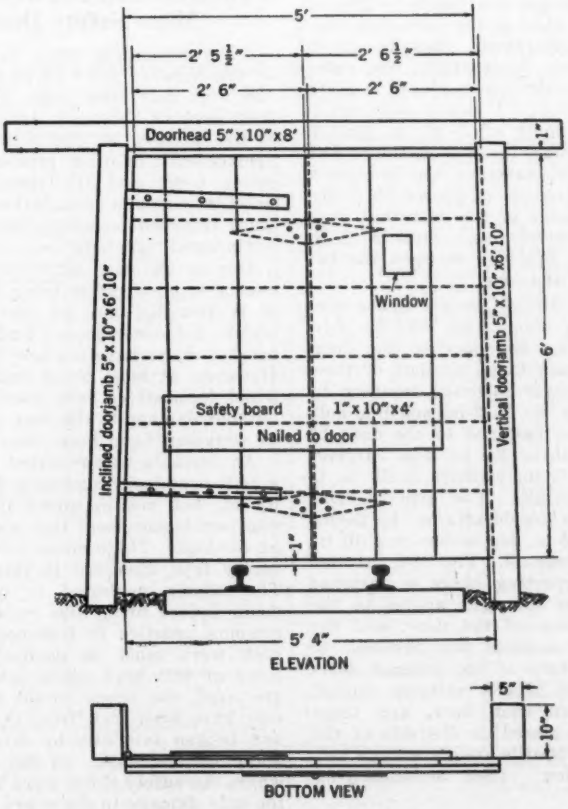
Doorframe—The doorframe consists of three members—one doorhead or cap 8 ft. long and two doorjambs or posts 6 ft. 10 in. long. These are cut from 5- by 10-in. stock and prepared in the carpenter shop on the surface for installation underground.

The vertical doorjamb is provided with square ends; and as the frame is built with one doorjamb inclined 4 in. in 6 ft., the inclined doorjamb is beveled at one end to provide the proper pitch. When installed, the doorjambs are 5 ft. apart at a point 1 in. below the cap and 5 ft. 4 in. apart at a point 1 in. above the haulage track.

The over-all length of the cap is 8 ft., and grooves 5 in. wide and 1 in. deep are cut across the full width of the 10-in. face of the cap to receive the posts at a point equidistant from the center. Grooves are spaced 5 ft. apart, and one groove is shaped to receive the inclined post that is cut on a bevel. The cap is set 6 ft. 2 in. above the top of the rails, leaving a 1-in. opening at both the bottom and top of the 6-ft. door.

Care must be exercised when a doorframe is installed so that adequate clearance is maintained between a car or locomotive and the door, when the door is in the open position after a collision has occurred. It is also important that the area surrounding the door be kept clean and free from obstructions at all times, so that the door may function properly.

Door—The door is constructed of a double thickness of rough 1-in. boards, with each layer of boards placed at right angles to the other; and a double thickness of treated fabric cloth, cut from discarded fan tubing, is placed between these vertical and horizontal layers, which prevents leakage of air through the door. Doors are 6 ft. high, 5 ft. wide at the top, and 5 ft. 4 in. wide at the bottom (the same width as the opening in



Door and doorframe are built of wood. The hinged construction provides against severe damage from nearby blasting or impact of locomotives, cars, etc.

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the doorframe). One edge of the door is battered 4 in. in 6 ft. to fit the side of the doorframe built in a similar manner. The door and doorframe are battered so that the door will close by gravity when not secured in open position.

The safety feature is provided by the door being divided into two vertical sections; these sections are fastened together with strap hinges on one side and with a "safety board" on the other. The only contact the door has with the doorframe is on the edge opposite the supporting hinges, where the door overlaps the vertical doorjamb 1 in. Openings at the top, bottom, and side of the door where supporting hinges are placed, which would permit leakage of air through the door, are closed effectively by fastening strips of treated fabric cloth cut in suitable size and shape over these openings. Strips on the hinge side are fastened to both the door and doorframe, while strips at the top and bottom are fastened to the door only. A 6- by 8-in. opening, fitted with safety glass, may be provided in the door for observation if desired.

The door is built as a unit in the carpenter shop on the surface. Boards placed in a vertical position are fitted so that the dividing point where "crash" hinges are placed is 30½ in. from the edge of the door that overlaps the doorjamb. Boards, 12 in. wide, placed horizontally, are nailed securely to the boards placed in a vertical position. A power saw, set to cut to a depth of 1 in., is used to divide the door into two sections. This cut, which traverses the horizontal layer of boards, is placed 30 inches from the edge of the door that overlaps the doorframe. Thus a ½-in. overlap is provided between the two sections of the door.

Hinges—Hinges, forged in the mine blacksmith shop from ⅜- by 2-in. stock, fasten the door to the doorframe. Each hinge consists of three separate parts fastened together by means of a ⅝- by 7-in. machine bolt. The section fastened to the door by means of three ½- by 3-in. carriage bolts and ⅝-in. washers is 28 in. in length over-all. The two sections fastened to the doorframe by means of ⅝- by 5-in. lag screws are 10 in. in length over-all. The 28-in. section of the supporting hinge is fastened to the door at right angles to the battered edge of the door, and the other two sections are fastened to the 10-in. face of the inclined doorjamb. Two hinges, suitably spaced, are used on each door, and these hinges are placed on the side of the door where boards are placed in a vertical position. (See accompanying sketch.)

To support the individual sections of the door and impart the safety feature to the door are 14-in. strap hinges such as those obtainable at any hardware store. These hinges are fastened to the door sections by means of wood screws and four ⅜- by 2½-in. carriage bolts—two bolts on each section of door. These hinges are placed on the side of the door provided with horizontal boards.

Safety Board—The two sections of the door are secured by a "safety board" nailed to the door on the side opposite that on which the safety hinges are placed. Experience has taught that a 1- by 10-in. board, 4 ft. long, should be used; and the board should be fastened securely to the door by nails long enough to be clinched on the opposite side of the door. This is necessary so that constant jarring due to opening and closing of the door does not cause the safety board to loosen, permitting the door to fold.

The door should function like any solid door until struck a severe blow, which would cause the safety board to break and permit the door to fold back. The safety board should be placed in such a position on the door that it will be opposite a point that will be struck by a locomotive bumper or a car coupling if a collision occurs.

Experience in Use of Steward Mine Safety Door

Fifty-two safety doors were in use at the Steward mine 10 months after the first door was tried out in the first week of February, 1943. Seventy-five percent of this number were replacements of other type doors formerly used, and the remaining 25 percent were new installations. Doors were installed in either timbered or untimbered openings.

Due to the ease with which doors can be repaired after being damaged, it is thought that all instances in which locomotives or trains have crashed doors have not been reported. However, at least three instances in which locomotives have crashed doors without damage to the door or injury to workmen have been recorded.

An instance was reported in which a drift round was blasted in the vicinity of, but not in direct line with, two ventilation doors that constituted an air lock. These doors were of the safety type discussed in this article. The miners neglected to open the doors before firing the round, as is common practice in instances where such work must be conducted. In cases of this kind where solid doors are used, the doors would undoubtedly have been torn from the hinges and broken into bits by forces produced by the blast. In the instance where the safety doors were involved, the only damage to the doors was the destruction of the safety boards. The safety boards were readily replaced, and the normal ventilation currents of the mine were disturbed for a relatively short time. Ventilation was often disrupted when solid doors were broken, for they were invariably put out of commission when accidental damage occurred.

The installation of these safety doors has reduced accident hazards from crashed doors, has saved time and material, and has been a factor in stopping some disruptions in ventilation.

The company does not use this door exclusively in all its mines. The door is not leakproof under high ventilating pressures; it is more suitable for low pressures, probably 1-in. water gage and under.

The door fits on all cages when in a folded position, and the folding feature is often advantageous when a door must be transported some distance to the place where it is to be installed.

Acknowledgment

Acknowledgment is made to Fred V. Lane, designer; Stephen Hurley, foreman, Steward mine; Timothy Driscoll, ventilation and safety engineer, Steward mine; A. S. Richardson, ventilation engineer, Anaconda Copper Mining Company; and an article published in the *Copper Commando*, official Labor-Management Committee newspaper, Anaconda Copper Mining Company, published in Butte, Mont., for the information concerning the construction, installation, and applicability of this door. Acknowledgment is also made to H. J. Rahilly, general superintendent of mines, Anaconda Copper Mining Company, for his comments and for reviewing and making available information used in this report.

UNDERGROUND POWER

The Question "Why Use Alternating Current Power for All Underground Equipment" Is Discussed and Comparative Power Costs for A.C. and D.C. Operation Are Estimated for Several Typical Mechanized Mining Systems

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West Virginia Engineering Co.

SINCE several new mines have recently been opened where alternating-current power is being used for all underground equipment, many operators have been asking this question: Why use alternating-current power for all underground mining? The answer is that several factors, such as power costs, maintenance, and initial costs are responsible for the change from direct-current power to alternating-current power, especially for mechanized mining.

In this article the power cost factor is to be analyzed and no doubt the other factors mentioned will be given consideration by other authorities. Since nearly all coal companies purchase power from central utilities which have tariffs that show a different cost per unit for electrical energy, it is proposed to conduct this analysis on a basis of power use or kw-hr. per ton. These two terms, "kw-hr." for electrical energy and "tons" for coal production are universal to all mines and the individual operator can apply the particular costs of any tariff to determine the power costs.

This analysis must be general in nature in order to include, as far as possible, the various types of mechanized equipment and the proposed method will be to make the following determinations: first, a reasonable value for face power consumption; second, the transmission of this low voltage face power from some source of supply; third, the power necessary for coal transportation; and fourth, the power necessary for high tension voltage transmission of this power into the underground areas. The power for ventilation, drainage, and coal preparation is not to be included because, at most mines, these electrical loads are now provided with alternating-current power.

The Mine to Be Considered

Some particular mine must be considered to make the analysis comparable and for this purpose several typical mining and transportation plans for loaders and conveyors are shown on the accompanying diagram. In calculating the power costs it is assumed that the main entries have been developed at least 4,000 ft. from the portal with main cross entries turned to the right and left of this main entry at a distance of approximately 3,000 ft. from the portal. These cross entries have been extended approximately 1,000 ft. from the main entries with the first room panel entries fully developed for a distance of 3,000 ft. paralleling the main entries. This will provide four working sections; one in the room panel to the right of the mains, one in the room panel to the left of the mains and two developing sections for other room panels adjacent to the other areas.

Now, for a coal seam thickness of 30 to 40 inches, the equipment for coal extraction is to consist of conveyors and will subsequently be referred to as the "conveyor mine." The distribution of the units is to be as follows:

Six (6) face units in the first room panel to right of the mains.

Six (6) face units in the first room panel to the left of the mains.

Three (3) face units to develop the right main cross entries and the second room panel entries.

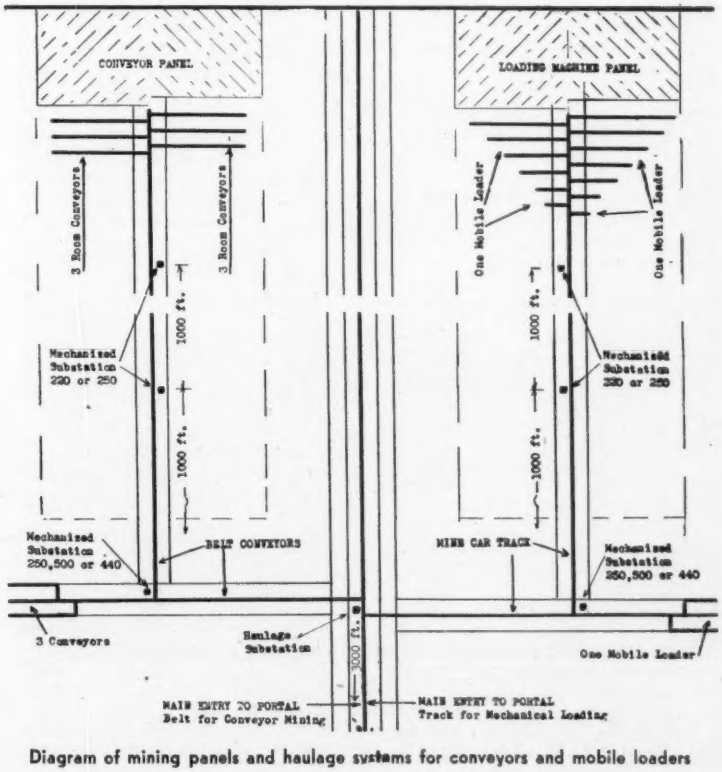


Diagram of mining panels and haulage systems for conveyors and mobile loaders

Three (3) face units for similar development in the left side of the mine.

A total of eighteen (18) face units is indicated and each face unit is to consist of a mining machine, coal drill and conveyor. If the conveyor is of the chain type, a 10 h.p. room drive and 5 h.p. face drive is considered. If the shaker type of conveyor is used, the drive is to be 15 h.p., which will equalize the horse power in service. Coal production from such a mine is assumed to be 50 tons per face per shift and for two-shift operation in a 26-day month, the production would be 46,800 tons.

For the conveyor mine supplied with alternating-current power, all coal transportation from the room neck to the portal is to be with belt conveyors. For the conveyor mine supplied with direct-current power, a gathering conveyor, either 300 ft. or 600 ft. in length, will be used to deliver coal to mine cars on a track with locomotives moving trips of loaded cars to the portal.

If the coal seam thickness is 42 in. or higher, mobile loaders are to be used and this mine will hereafter be designated as the "mobile loader mine." The distribution of the units is to be the same as the conveyor mine but each mobile unit will take the place of three conveyor face units. A total of six (6) mobile sections is indicated and each section is to consist of a mining machine, coal drill, and mobile loader. Coal production from each section is assumed to be 250 tons per shift or, for two-shift operation and a 26-day month, the production of 78,000 tons can be expected.

For the mobile loader mine where alternating-current power is supplied, a room conveyor will be used to move the coal from the face to the room neck. With the mine supplied by direct-current power, the mine cars are to be loaded directly at the face with gathering locomotives moving the cars to a nearby storage track.

Power for Face Equipment

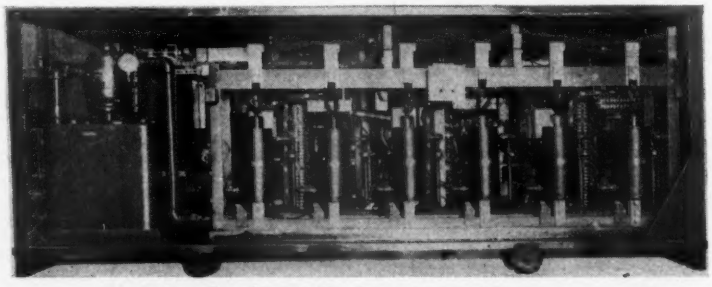
The actual power delivered to the various units of equipment used in the production of coal from a room neck to a completed room of 300 ft. in length has been found, from tests, to be about as follows:

	Kw-hr. per ton
Mining machines (short wall)	.400
Drills	.001
Loaders (mobile)	.250
Conveyors	.280
Locomotives	.250

Undoubtedly other tests, where conditions are not the same or where different types of units are used, will show far different values but this data can readily be used for the assumptions which are to be made in this analysis. It is reasonable to assume that, regardless of whether alternating or direct-current power is supplied the face equipment, the power use would be the same for similar units inasmuch as each unit is converting electrical energy to mechanical energy. The efficiencies of the respective motors may differ for alternating or direct current power but this factor will not be great enough to make any change.

On the foregoing assumptions the necessary electrical energy can now be determined and for the conveyor mine, the face power per unit for either alternating or direct-current power systems is:

	Kwh. per ton
Mining machine	.400
Drill	.001
Conveyor	.280
Total per unit	.681



Portable rectifier for mining service

The monthly energy for the face equipment producing 46,800 tons as previously described can be estimated as being 35,000 kw-hr. when an allowance of about 10 percent is made for handling supplies and moving.

For the mobile loader mine supplied with a direct-current system, the power per loader section is:

	Kw-hr. per ton
Mining machine	.400
Drill	.001
Locomotive	.250
Mobile loader	.250
Total, Loader section	.901

The monthly energy for this face equipment can be 77,300 kw-hr. and the 10 percent allowance is included for the transportation of supplies and moving.

For the mobile loader mine supplied with an alternating-current system, the power for each mobile section is:

	Kw-hr. per ton
Mining machine	.400
Drill	.001
Conveyor	.280
Mobile loader	.250
Total, Loader section	.931

When the usual 10 percent allowance for transportation of supplies and moving is made, the monthly power use for a production of 78,000 tons as previously described will be 79,880 kw-hr.

Transmission of Low Voltage Power

The power used by the face equipment must be transmitted by electrical conductors from some source of low-voltage supply and the accompanying tabulation shows the power calculated for various methods of mining and transmission.

For the alternating-current systems, a bank of transformers of at least a total of 225 kv-a will be necessary for each of the room panels and another bank of about a total of 112.5 kv-a will be needed for each developing section. Experience has proven that for an electrical load, as suggested herein, the distance of power transmission at 220 volts must not be greater than 1,000 ft. but at 440 volts, this distance can readily be 3,000 ft.

For the direct-current systems, it is proposed to use a 300 kw. converting station at the entrance of each room panel. Since the 220-volt alternating-current system is limited to 1,000 ft. for distribution, a direct-current system of 250 volts which limits the distribution distance to 1,000 ft. is also given in the tabulation. The prevailing system is where direct-current power is transmitted for distances of 3,000 ft.

A 500-volt direct-current power system will not be permitted in new mines but the data is given to show the lower power losses when compared to the other systems. The 440-volt, three-phase, alternating-current power system may be questionable to some operators but with a four-wire grounded system and all three power conductors completely insulated, the voltage to ground is only 256 volts. In fact, a 440-volt alternating-current system can be made less hazardous than either a bare-wire system of 220 volts, three-phase, alternating current or the 250-volt direct-current system.

(*Continued on page* 39)

CALCULATED POWER REQUIRED FOR CONVEYOR AND MOBILE LOADER MINES
Operating With A.C. and D.C. Under Various Conditions of Conversion and Transmission

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Power System	Distance of Low Voltage Distribution Feet	Type of Substation Equipment	Substation Efficiency %	Face Power Delivered to Machines Monthly K.W.H.	Face Power Substation Output Monthly K.W.H.	Face Power Substation Input Monthly K.W.H.	Haulage Substation Output* Monthly K.W.H.	Haulage Substation Input* Monthly K.W.H.	Total Power Face to Portal† Monthly K.W.H.	Monthly K.W. Demand at 40% Load Factor	Total K.W.H. Per Ton Coal
Conveyor Mines—46,800 Tons Per Month											
A.C.220	1,000	Transform.	95	35,000	41,915	44,121	47,408	49,693	96,894	336	2.07
A.C.440	3,000	Transform.	95	35,000	36,500	38,421	47,408	49,693	91,194	317	1.95
D.C.250	1,000	M. G.	60.25	35,000	41,831	69,429	46,800	77,676	150,784	523	3.22
D.C.250	1,000	Rotary	66.91	35,000	41,831	62,518	46,800	69,994	136,191	474	2.91
D.C.250	1,000	Rectifier	84	35,000	41,831	49,800	46,800	55,714	109,193	380	2.34
D.C.250	3,000	M. G.	60.25	35,000	46,450	77,095		77,676	158,450	550	3.38
D.C.250	3,000	Rotary	66.91	35,000	46,450	69,421		69,994	143,094	497	3.06
D.C.250	3,000	Rectifier	84	35,000	46,450	55,300		55,714	114,693	397	2.44
D.C.500	3,000	M. G.	60.25	35,000	36,168	60,029		77,676	141,384	491	3.02
D.C.500	3,000	Rotary	66.91	35,000	36,168	54,054		69,994	127,727	444	2.73
D.C.500	3,000	Rectifier	84	35,000	36,168	43,057		77,676	124,412	432	2.66
Mobile Loader Mines—78,000 Tons Per Month											
A.C.220	1,000	Transform.	95	79,880	97,164	102,279	65,028	68,450	173,809	603	2.23
A.C.440	3,000	Transform.	95	79,880	83,400	87,789	65,028	68,450	159,319	553	2.04
D.C.250	1,000	M. G.	60.25	77,300	92,385	153,336	78,000	129,460	286,475	994	3.67
D.C.250	1,000	Rotary	66.91	77,300	92,385	138,073	78,000	116,574	258,326	897	3.31
D.C.250	1,000	Rectifier	84	77,300	92,385	109,982	78,000	92,857	206,518	717	2.65
D.C.250	3,000	M. G.	60.25	77,300	102,587	170,268		129,460	303,407	1,054	3.89
D.C.250	3,000	Rotary	66.91	77,300	102,587	153,320		116,574	273,573	950	3.51
D.C.250	3,000	Rectifier	84	77,300	102,587	122,127		92,857	218,663	760	2.80
D.C.500	3,000	M. G.	60.25	77,300	79,880	132,581		129,460	265,720	922	3.40
D.C.500	3,000	Rotary	66.91	77,300	79,880	119,384		116,574	239,637	832	3.07
D.C.500	3,000	Rectifier	84	77,300	79,880	95,095		92,857	191,631	665	2.46

* See column 3 for substation equipment and column 4 for substation efficiency.
† Includes High Tension Power loss of 3080 K.W.H. for A.C. and 3679 K.W.H. for D.C. systems, as shown in col. 1.

The low voltage conductors to be used in the alternating-current power systems are to consist of three 500,000 c.m. insulated cables. The conductors for the direct-current power system are to consist of two 750,000 c.m. cables. The total cross section area of the conductors of any system will be the same. On this basis calculations of the estimated losses have been made for each low voltage system between the source of supply and the face equipment. The results obtained have been added to the face power, which is the total output of each station and these values are given in column 6 of the tabulation.

Conversion of Face Power

The source of supply for the face power has been mentioned as either transformers or a 300 kw. substation. The converting substation can be one of three types, which are: motor-generator sets, rotary converters or the modern rectifiers. The type of station used for the various systems is shown in column 3 of the tabulation. The efficiencies of the transformers are taken as 95 percent for all-month a.c. operation. For d.c. operations, recent tests of converting stations have been made and the all-month efficiencies, for comparable mining activities, are shown in column 4 of the tabulation.

The estimated monthly input to these stations has been made and the results shown in column 7 of the tabulation.

Air-cooled transformer installed underground

Giving the estimated quantities of power necessary for the production of coal by the face equipment with the exception of the high tension

supply to the station. The losses for the high tension circuits will be given but will also include the power for coal transportation. A comparison can be made by a study of the data shown in columns 1 to 7 inclusive. The power transmission and conversion losses are greater than the actual face power use for the M. G. and Rotary 250-volt systems at 3,000 ft. distribution, which are the two systems in greatest use.

Power for Coal Transportation

The mine supplied with alternating-current power will have belt conveyors for coal transportation. The main entry belt will be driven by a motor at the portal while the cross entry belts will be driven by motors located at the discharge end of these belts on the main entry. The room panel entries will have belts of 3,000 ft. in length with the motors located at the discharge end on the cross entries. Each belt motor is to be provided with a bank of transformers for, at some later date, these belts are to be moved to a new location.

The estimated monthly power necessary for these belt motors, based on tests of conveyors driven by both alternating and direct-current power, shows the conveyor mine to be 47,408 kw-hr. and the mobile loader mine to be 65,028 kw-hr. The low voltage transmission loss is not considered as the transformers can be located adjacent to the motors.

For the mines supplied with direct-current power, the haulage locomotive power, including low-voltage transmission losses when adequate conductors are used, is taken as 1.0 kw-hr. per ton and is a reasonable value for the distances involved. Converting substations of 300 kw. capacity located near the junction of the cross entries and the main entry are assumed for all direct-current power systems.

The estimated power necessary for the haulage systems is shown in column 9 of the tabulation and the final results of all input power to the stations are shown in column 10.

Power for High Tension Transmission

Calculations have been made of the expected average losses for economic size conductors to supply high tension, three-phase, alternating-current power. The loss for the mine supplied with alternating-current power would normally be lower than one supplied with direct-current power because of lower electrical capacity. The results of the calculations are shown in the footnote of column 10 of the tabulation.

Conclusions

The total estimated monthly power necessary for face production and coal transportation from the face to the mine portal is shown in column 10 of the tabulation while the expected monthly 15-minute power demand, based on a 40 percent load factor, is shown in column 11. The power use or kw-hr. per ton is shown in column 12 of the tabulation.

A study of this data will show that the alternating-current power system requires less electrical energy and the 440 volt system is lower than the 220 volt system. The greatest power use is shown for the 250 volt system with motor-generator sets as the converting units. The direct-current power system, using the modern rectifier when it is moved every 1,000 ft., shows a very favorable comparison.

Two examples are shown to determine the power costs.

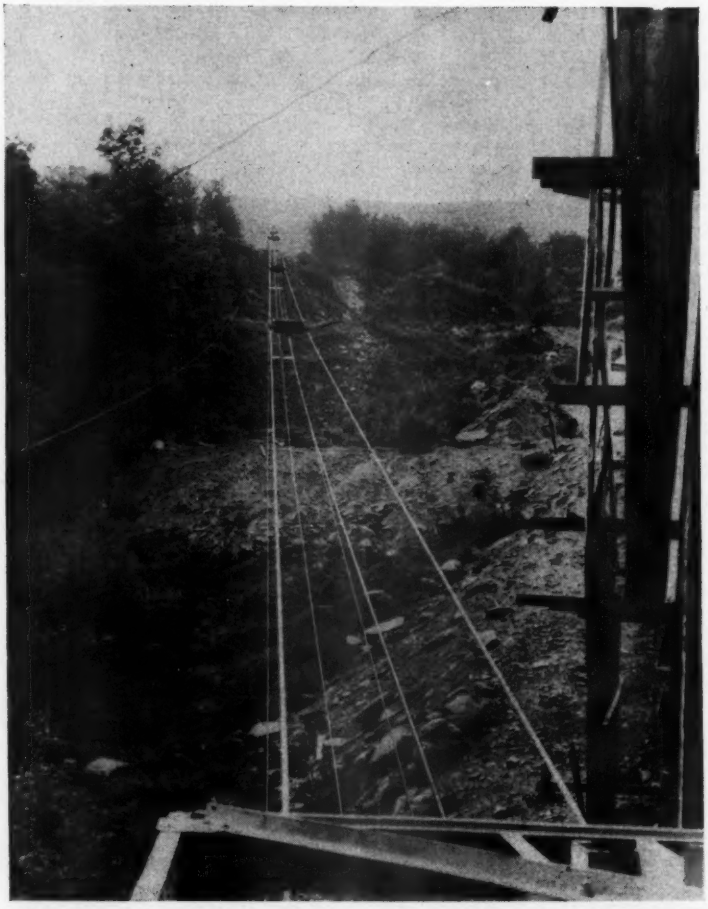
1. Assume the energy cost to be 1c per kw-hr. and the demand cost to be $1.75 per kw. Then, for the 220-volt conveyer mine, using 96,894 kw hr. per month (col. 10), the power cost would be:

Demand	588.00
Energy	968.94
Total	$1,556.94

or 3.327c per ton

2. From a recent power bill, take the net amount charged for power and determine the average total cost per kw-hr. by dividing this amount by the total kw-hr. Such a cost would likely be about 1.4c per kw-hr. Then, the energy use for the 220 volt system of the conveyor mine (96,894 kw-hr.) should be multiplied by this unit cost of energy making a total cost for face production and transportation of $1,356.52 or 2.9c per ton.

This method would probably be more suitable as the power cost for ventilation, drainage, preparation and other power loads would not be included.



Aerial tramway recently constructed at the Vermont asbestos mine of the Ruberoid Co., near Lowell, Vt. Forty-two 1-ton tramcars spaced at 240-ft. intervals can deliver 2,500 tons of asbestos ore a day to the mill a mile away

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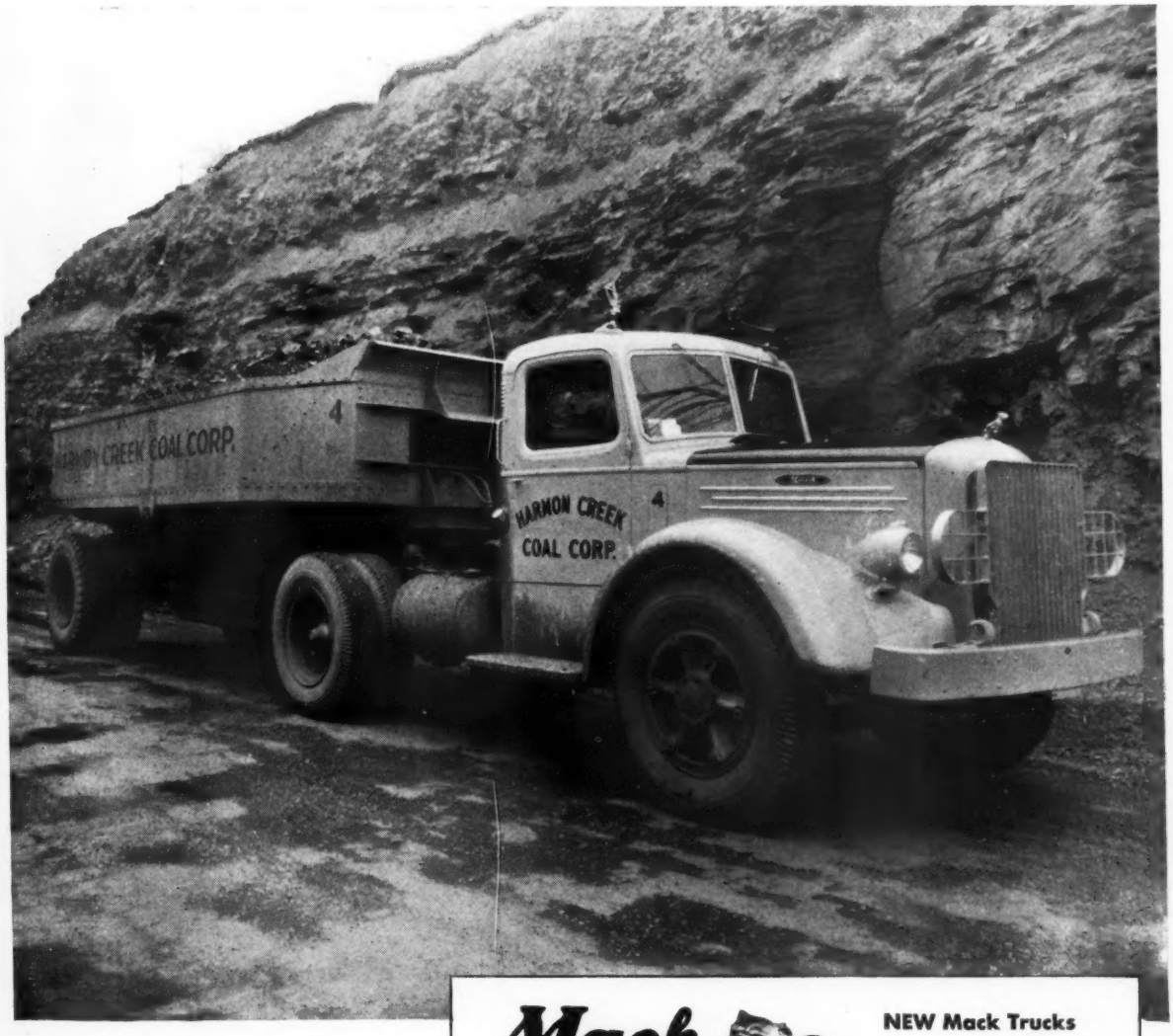

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20 HEAVY-MEDIA SEPARATION PLANTS
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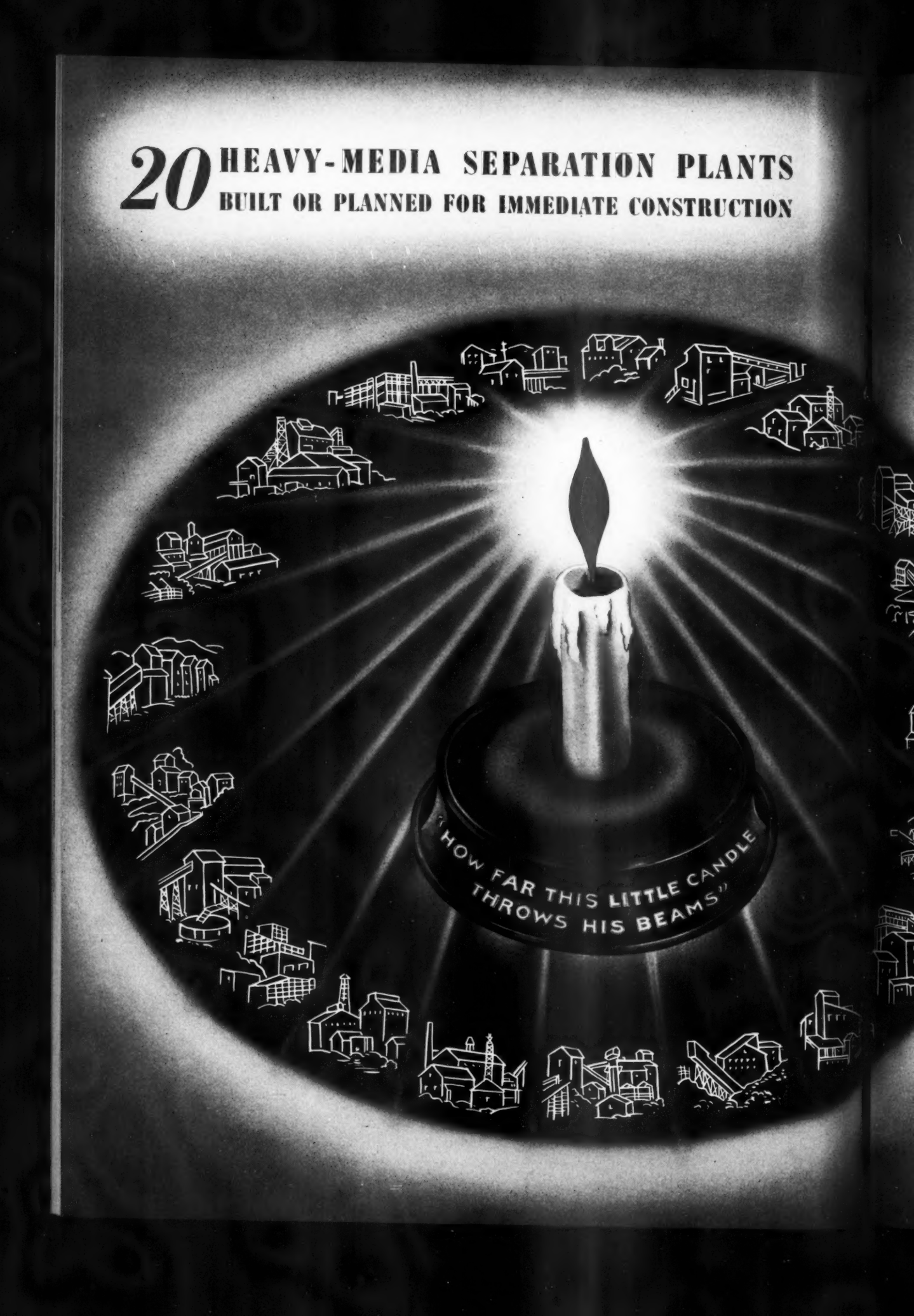

Heavy-Media Separation (Sink-Float) plants now operating and planned for immediate construction have a total capacity of over two-million tons a month. Iron, Zinc, Lead-Zinc, Lead-Zinc-Silver, Magnesite, Fluorspar, Tin, Garnet and Coal are now among the minerals to be treated. And continuous-unit testing in the Cyanamid Mineral Dressing Laboratory indicates that many other minerals can be beneficiated by this economical separation process.

With record breaking production causing rapid depletion of higher-grade reserves, many properties are studying the economics of profitable post-war operation on lower-grade deposits. Here Heavy-Media Separation, among all concentration processes, seems to offer the most likely opportunities for worthwhile economies. For instance . . .

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Heavy-Media Separation is the lowest-cost method of achieving accurate separation of values from waste in a range of gravities which cannot be attained by any other process. In a continuous operation, it makes a sharp separation within ± 0.01 gravity in a range of gravities from 1.25 to 3.40. Plants can be designed to make a multiple-product separation at any pre-selected gravities. Operating in a closed circuit with negligible loss, medium costs are low. Ores too low-grade to be treated by any other method can be beneficiated economically by Heavy-Media Separation.

Ore Dressing Notes #13, describing Heavy-Media Separation with particular reference to coal cleaning, will soon be ready for distribution. Ore Dressing Notes #14, describing Heavy-Media Separation plants now beneficiating metallic and non-metallic ores, is in preparation. Copies of either or both will be sent without obligation.

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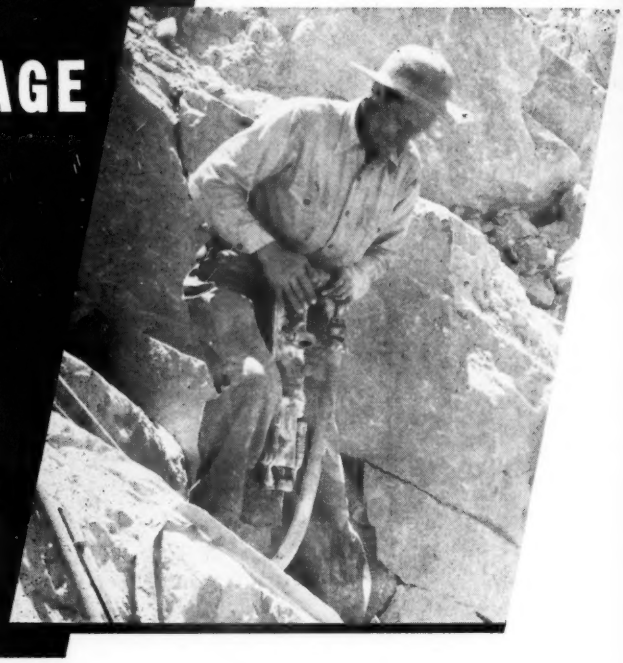

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American Mining Congress Opposes Further Tariff Cuts

JULIAN D. CONOVER

Statement of Julian D. Conover, Secretary, American Mining Congress, Presented to the House Committee on Ways and Means In Re: H. R. 2652—Extending the Authority of the President Under the Reciprocal Trade Agreements Act

THE American Mining Congress, representing the various branches of the mining industry of the United States, views with serious concern the bill now before you, to extend and enlarge the authority of the President in making reciprocal trade agreements with foreign countries.

Our position on such legislation has been publicly stated on numerous occasions, and is well expressed in the following resolution which was unanimously adopted at our last annual Western meeting, in Denver, January 29, 1944:

TARIFF.

"The need for adequate mineral and metal production from the mines of the United States in time of national emergency has been forcefully demonstrated in the past three years. To protect our nation against any future threats to its security, and to permit continuation of a basic industry essential to the economy of the West, our mines must of necessity be kept in good operating condition, future reserves must be developed to the fullest extent possible, and new exploration must be encouraged. While the mining industry, in the interest of national and world prosperity, favors maximum international trade in time of peace, such trade must not be stimulated at the expense of national security. Domestic mines must be protected by a tariff adequate to offset richer natural deposits and lower costs in foreign countries."

In accord with this policy, we respectfully urge:

(1) That any extension of the Trade Agreements Act at this time be limited to a one-year period.

(2) That Section 2 of H. R. 2652, granting authority to decrease by 50 percent the reduced rates of duty in effect January 1, 1945, be deleted from the bill, and the authority to change tariffs be limited, as heretofore, to 50 percent of the statutory rates.

(3) That in any extension of the existing authority, provision be made for review by the Senate or by Congress of any proposed new agreements before they may become effective.

(4) That the President be permitted to make concessions on any commodity only to that country which constitutes the principal source of imports.

(5) That the "escape clauses" in existing and future agreements be made mandatory.

(6) That mandatory provision be made (a) for adjustments in tariff concessions in the event exchange rates are seriously altered, or substantial injury is otherwise done to established domestic industries, and (b) for withdrawal of "most favored nation" privileges from countries which in fact discriminate against American products.

The basis for these recommendations may be briefly stated.

(1) Limit Extension to One Year

Extension of the Act for a one-year period at this time is a logical step in view of the present disruption of normal international trade and the great uncertainties as to what the future may bring forth. It is called for by the same reasoning which impelled Congress in 1943 to reduce the period of extension from three to two years.

A one-year extension would give the authority needed to enter into any new agreements during the coming year, and would not of itself limit the life of such agreements or of the agreements already in force. It would, however, bring the entire question automatically to the attention of Congress again next year, when further and more intelligent action can be taken in the light of domestic and world conditions then seen to exist.

This recommendation has been ably presented by other witnesses and there is no need of our discussing it in further detail.

(2) Limit Tariff Reductions to 50 Percent of Statutory Rates

The original Trade Agreements Act of 1934 granted authority to reduce by 50 percent the rates of duty established under the 1930 Tariff Act. As to metals and minerals, the rates under the 1930 Act were in most cases unchanged from those fixed by the 1922 Act, and represented the minimum of protection required by the domestic industry. Reductions from those rates—such as have been made on zinc and cadmium under the Canadian agreement; on zinc, lead and molybdenum under the Mexican agreement; and on petroleum (affecting likewise the bituminous and anthracite coal industries) under the Venezuelan and Mexican agreements—have been of serious consequence to American mines and mine workers. Thus far the effect has largely been obscured by the war, with its unprecedented requirements for metals and minerals; but in the post-war period our domestic industry is due to suffer heavily from the increased competition of low-cost foreign mines, made possible by these reductions in our tariff protection. Legislation permitting the reduced rates of duty to be again cut in half would be calamitous to the industry and we urge that it be rejected.

It has been said that such legislation would be permissive only, and that the authority so granted would be used wisely and "in such a way as not to disrupt American employment and industry." To this we can only reply by referring to the record.

Zinc was the first important domestic mining and smelting industry which suffered a cut in its tariff protection under the reciprocal trade program. The established rates on zinc ore and metal were cut 20 per cent in the Canadian trade agreement,

signed November 17, 1938, and effective January 1, 1939. Immediately following the signing of the treaty, the price of zinc dropped $7 a ton—the exact amount of the duty cut—to meet the competition of foreign zinc, offered for future delivery at the London price plus duty. Results of the duty reduction were heavy financial loss to the industry, lower earnings by employes, and a loss of confidence in the future which seriously decreased exploration for and development of new ore reserves. The industry could not understand—in view of the reiterated statements of Trade Agreement officials that no duty reductions would be made until after an exhaustive and careful study had given assurance that harm would not result—why it had been selected for such treatment; and a series of conferences and an exchange of memoranda with the State Department ensued. These made it abundantly clear that the duty had been reduced without any adequate comprehension of the facts, and without any such painstaking study as was claimed to be an integral part of the procedure.* It was noteworthy that the Bureau of Mines, the one Government agency fully conversant with the industry, had not even been consulted, although the Director of that Bureau a few months previously had publicly warned that a reduction in the tariff on this important defense metal would not be in the public interest.

In the same agreement the duty on cadmium was reduced 50 percent, with the totally erroneous statement that cadmium "is a by-product of the copper refining industry"—although the facts are that practically no cadmium is produced as a by-product of copper refining and that over 95 percent of the output is produced in the smelting and refining of zinc. Thus the zinc industry was hit a double blow, based on an entire lack of understanding of the facts, and without any evidence of the "infinite care and caution" which are said to characterize the negotiation of trade agreements.

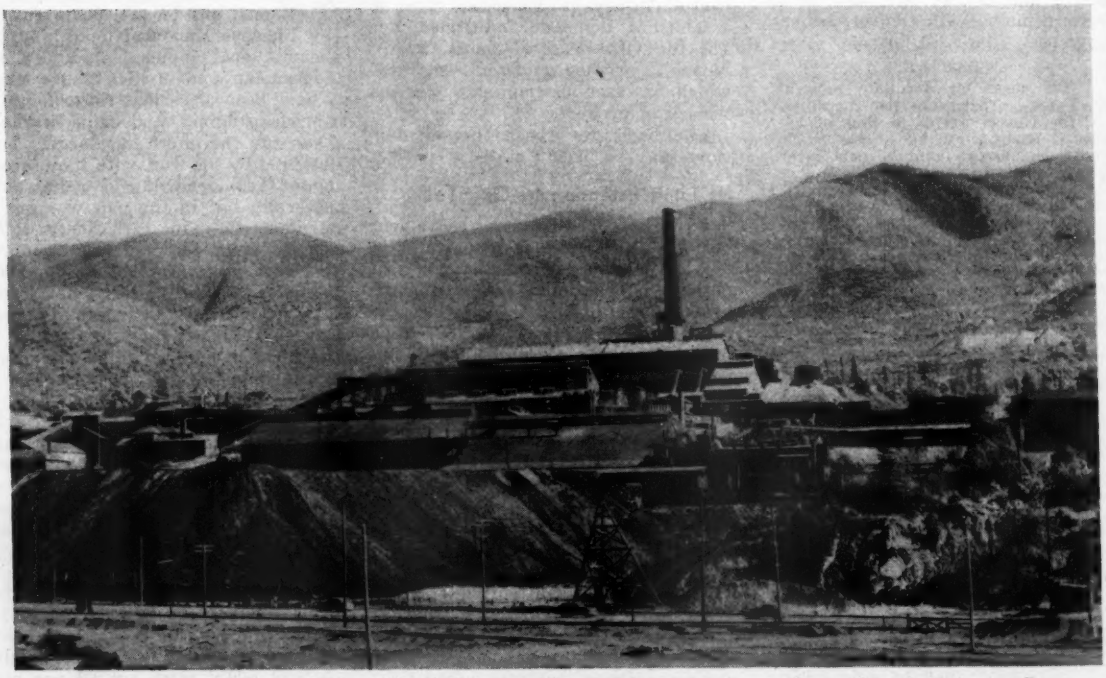
We cite this case in some detail, because the results of the arbitrary action taken have been all too painfully impressed upon us; but it is not an isolated example. Many other instances have been cited where duty reductions have not been the outcome of "careful, painstaking" findings of fact, but have seemed to reflect an ardent zeal to lower tariffs regardless of the harm done to an industry within this country.

Under such circumstances, we cannot approve the proposal to grant additional powers to the Executive, whereby duties already reduced under a trade agreement could again be cut in half.

On certain mineral commodities—notably lead and zinc—the duties were reduced by a full 50 percent in the agreement with Mexico, but with a proviso restoring them to a higher level following the war. The mining industry made no objection to the 50 percent reduction in the event it were found necessary as an emergency measure, to aid in the prosecution of the war, but we insisted that such reduction should be temporary and limited to the war period. Under Section 2 of H. R. 2652, however, not only could the post-war restoration of the higher rates be cancelled, but a further reduction could be made from the 50 percent level (in effect January 1, 1945), *to only* 25 *percent of the rates established in* 1922. We shudder to think what this would mean to our American lead and zinc mines and to the important communities and related industries which are dependent upon them.

If your committee is seriously considering the granting of such sweeping authority, may we, with all due respect, suggest that you ask those administering the Trade Agreements Program to name specifically the commodities as to which they feel they must have the power to make these further reductions. Isn't it only fair that both our own producers and the members of Congress as a whole be given a definite statement, as to those items on which it is proposed to make still further reductions in tariff protection than are permitted under the existing law? In recent discussions of this legislation there has been much emphasis on raw materials; and certainly those industries and those parts of the country which

* See detailed statements on this subject in the record of the hearings before the Committee on Ways and Means on H. J. Res. 407, Volume 2, January 25, 1940, pp. 1569-1584; also Volume 3, January 29, 1940, pp. 2053-2057, and January 31, 1940, pp. 2416-2429.



Giant smelters like that of Bunker Hill and Sullivan in Idaho employ many men and are dependent upon well established and secure home markets

produce raw materials would be deeply interested in the answer to such a question. If a definite answer cannot be given, Congress might well consider the desirability of specifying certain commodities or groups of commodities as to which the power to make further tariff reductions would be withheld.

(3) Agreements Should Be Subject to Review By Congress

The mining industry has always taken the position that Congress, representing the people, should have the right to review and pass upon all Trade Agreements before they become effective. It has been our view that these "agreements" are in fact treaties and as such should be subject to ratification by a two-thirds vote of the Senate. This is well expressed in a recent editorial in the *Engineering and Mining Journal*, which advocates "compliance with the plain behest of the Constitution by submitting treaties to Senate ratification," and goes on to say:

> "We believe that Congress is conscious of its new responsibilities and will not stoop to the log-rolling tactics characteristic of tariff action in former days. Ratification would be a check on the zealotry and double-talk which are demonstrable in past administration of the program."

The powers given to executive agencies under the Trade Agreements Act are extremely broad. They include the power of life and death over important segments of American industry. They are too great a responsibility for any Government agency not directly accountable to the people. When they are exercised by men imbued with a fervent desire to increase imports, with a single-minded devotion to lower tariffs, the welfare of domestic industries may receive all too little consideration. Quite apart from the constitutional question involved, there should be some check, some means of restraint, to guard against excessive zeal in the negotiating of these agreements.

As an alternative to Senate ratification, it is suggested that the terms of a proposed agreement be made public at least three to six months prior to becoming effective, and that either the Senate, on action of one-third of its members (expressed by petition or otherwise), or the Congress by joint resolution, have the power during that period to disapprove and reject any tariff change contained in the proposed agreement; in the absence of such petition, the agreement to become effective as proclaimed.

A requirement that trade agreements be subject to review by the elected representatives of the people—either for affirmative approval or the opportunity to refuse approval—will remove the secrecy that has characterized previous agreements, will necessitate a genuinely scientific and impartial trade agreements organization that will proceed on the basis of carefully determined facts, and will insure proper consideration of domestic producers and workers throughout the process of negotiating an agreement.

(4) Limit Tariff Concessions to Principal Supplier

From the outset of the Trade Agreements program, the announced policy has been to make tariff concessions on any commodity *only to that country which constitutes the principal source of imports.*

This policy was explicitly set forth by the State Department when the Act was originally under consideration in 1934 (Finance Committee hearings on H. R. 8687, April 27, 1934, p. 114); it has been referred to repeatedly during the past 11 years, and was again emphasized by Mr. Charles P. Taft of the State Department in an address at Minneapolis on March 30, when he said "the bargaining will take place with the principal suppliers as before . . . "

Unfortunately, this policy has not been adhered to, and numerous important concessions have been made to countries which are only minor sources of supply. The concessions on zinc and cadmium made to Canada, previously referred to, are examples. In the first 12 months under this agreement Canada supplied only 12 percent of our total zinc imports, while 59 percent came from Mexico and the balance from Peru, Belgium and other countries. In the same period only 8 percent of the benefit from the cadmium concession went to Canada, while Belgium secured 71 percent and the Netherlands, Italy and other countries secured the remainder. The major benefits—entailing the major damage to domestic producers—were extended under the most-favored-nation treatment *to countries from whom we received no concessions in return.* Many other examples could be cited, including several cases in the mineral field in which the trade agreement country to which the concession was made was supplying no imports whatever to the United States. The agreements have apparently been used primarily as a vehicle for general tariff reduction, rather than as a means of bargaining for advantageous concessions on our exports.

We believe the Act should be amended to insure that the stated policy will be adhered to, by requiring that tariff concessions on any product may be made *only to that country which is the principal source of imports*, and which is thus in position to trade us something worth while in return. To further implement this principle we suggest an additional amendment to the Act, as proposed by us in 1940, as follows:

> "When for a period of six months total imports of any article the growth, produce or manufacture of any foreign country on which the rate of duty has been reduced in any trade agreement negotiated hereunder from countries other than the signatory country shall exceed those from the signatory country, the President shall take the necessary steps to withdraw the concession made to such signatory country on such article."

(5) Make Escape Clauses Mandatory

Most of the trade agreements concluded under the Act contain an "escape clause" providing for withdrawal or modification of the concession granted on any article, if as the result of extending such concession to other foreign countries, such countries obtain the major benefit, and if in consequence imports of the article concerned increase to such an extent as to threaten serious injury to domestic producers.

Sponsors of the trade agreements program have made much of this "escape clause" as assurance of relief to an industry seriously injured by "third-country" importations. In our experience, however, the escape clause has been of no practical value whatever.

The zinc industry again affords an outstanding example. All the conditions required to invoke the escape clause were present and were ably and persistently presented by the industry over a period of many months. Careful studies by the U. S. Bureau of Mines and by the zinc expert of the Army and Navy Munitions Board demonstrated the need of remedial action. The Chairman of the Senate Finance Committee was so impressed by the showing made that he stated publicly that he thought a mistake had been made. Yet nothing was done to relieve the situation. In fact a further trade agreement was concluded with Mexico, freezing the reduced rate of zinc duty, and in addition making a similar cut in the duty on lead, which is a joint product of our zinc-lead mines.

Out of some 1,200 reductions in duties under the trade agreements to date, it appears that the escape clauses have been successfully invoked only in two minor instances, involving silver fox furs and embroidered handkerchiefs. Failure to apply them even where clear-cut need had been shown has been an outstanding weakness of the program. It should be corrected by a mandatory provision of the law.

(6) Require Revision of Agreements and Withdrawal of Most-Favored-Nation Treatment When Substantial Injury Results

Many of the trade agreements contain provisions permitting modification or cancellation where exchange rates have materially changed, to the detriment of American producers. To the best of our knowledge, however, no action has been taken under these provisions in any important instance, notwithstanding the excessive currency depreciation that has taken place in some of the trade agreement countries. In certain cases the change in the value of the foreign currencies involves even greater reductions in our tariff protection than were made in the trade agreements themselves. We believe the Act should *require* that corrective action be taken, to equalize and restore the tariff protection which remained when the agreements were promulgated.

In general, where an established domestic industry is substantially injured under a trade agreement (which may occur under conditions other than those covered by the escape clauses or due to currency depreciation), there should be some provision for review—possibly by the courts or by a non-political fact-finding tariff agency—leading to a reopening of negotiations with a view to withdrawing or modifying the concession.

The Trade Agreements Act, while theoretically providing for increases in duties where needed, in practice serves exclusively to reduce duties, to bind existing rates against increase, or to "freeze" articles on the free list. In the changing world economy that will follow the war, a sound tariff policy will inevitably require some upward revisions. The flexible provision (Sec. 336) of the Tariff Act of 1930, which permits tariff adjustments to equalize costs of production at home and abroad, has been nullified as to all commodities included in trade agreements. Provisions should be worked out whereby it may be restored and made effective.

Finally, our unconditional most-favored-nation policy has been extended on the broadest possible basis to practically all nations of the world. Many types of discrimination, including exchange controls, barter arrangements, etc., have been applied by various nations against American trade. The present discretionary authority, to suspend tariff concessions to third countries which discriminate against American commerce, should be supplanted by a definite provision of law, under which the most-favored-nation benefits would be extended *only to those countries which do not in fact discriminate against our products.*

* * * *

We believe that amendments to the Trade Agreements Act such as we have proposed will strengthen and improve it as an instrument of public policy and a means of building post-war prosperity. We believe they are in accord with the stated objectives of the Act, which include the maintenance of domestic employment and purchasing power, the raising of American standards of living, and the promotion of sound foreign trade "in accordance with the characteristics and needs of various branches of American production." We believe that prosperity, like charity, begins at home, and that an essential first step to world prosperity is the establishment of a sound and balanced prosperity in the United States. We believe that there is nothing gained by increasing employment in other countries at the expense of employment in our own country.

George Lohr Photo

The Capitol at night. Congress, representing the people, should have the right to review and pass upon all Trade Agreements before they become effective

In the over-all economy of our country the mining industries play an important role. Not only do they supply a major part of the raw materials for our vast manufacturing, processing, and construction industries, but in doing so they *create new wealth* from what would otherwise be an undeveloped resource. They are the basic support of large and important communities, and a careful study made in a representative Western state shows that for every worker in the mines, at least two and one-third additional workers in local service industries, or a total of 12 wage-earners and dependents, derive their income from mining. A major part of the population of the West is economically dependent upon mining activity, and neither this great region, with its substantial purchasing power, nor the country as a whole can hope to enjoy real prosperity unless the mining industry is prosperous.

The charge has been made that industries which require tariff protection have "the lowest wage rates in the country." This is not true as to the mining industries. The latest data compiled by the Bureau of Labor Statistics show average mining wages (metal and coal) in December, 1944, of from $1.019 to $1.187 an hour, with average weekly earnings of from $45.98 to $50.39; these compare with average earnings in durable goods industries of $1.140 an hour or $53.69 a week, in non-durable goods industries of $0.883 an hour or $38.40 a week, in public utilities of $0.815 to $1.126 an hour or $37.02 to $48.63 a week, and in wholesale and retail trade of $0.596 to $1.002 an hour or $22.07 to $43.55 a week.

Frequent reference has been made to the desirability of encouraging exports of the products of our mass production industries—such as automobiles, agricultural implements, machines of all types, household appliances, etc.—which are largely made from metals. The argument is sometimes made that duties on these metals should be reduced so that our manufacturers may enjoy lower raw material costs as an aid in building up their export business. What is generally overlooked, however, is that provisions of the existing Tariff Act (Secs. 311, 312 and 313) make ores and metals from foreign sources readily available to manufacturers of export articles, either with no payment of duty where smelted and manufactured in bond, or with a refund of 99 percent of the duty as a "drawback" when the manufactured articles are exported. These procedures are well established and extensively employed; consequently, the providing of cheap foreign materials for the export manufacturer in no way requires us to abandon the principle of reasonable protection for the domestic miner.

The suggestion has frequently been made that, following the war, industries may be converted to lines that do not need tariff protection. Such a proposal, of course, becomes ridiculous when applied to mining. Mines cannot be moved to other locations or converted to the production of other goods. Their locations, and the mineral content of their ore-bodies, have been fixed in long-past geologic periods. Many of them are in isolated desert and mountain areas, the entire populations of which are dependent upon them for support. Is it good policy to deprive these communities of their only means of subsistence and to throw their populations on public relief, at a cost far greater than any benefit that might be derived from bartering export goods for the equivalent amount of foreign minerals?

From the standpoint of national defense, the importance of a sound and healthy mining industry cannot be too strongly emphasized. Modern wars are fought with metals and minerals, and the nation that is not adequately supplied is powerless to defend itself against aggression. Stockpiles of strategic and critical metals and minerals are needed, as a reserve to be promptly available in an emergency for the production of military equipment. But stockpiles are only a first line of defense; our main reliance must be an active mining industry, prepared to maintain the flow of needed mineral raw materials to carry us through. To preserve important branches of our mining industry we must maintain a reasonable degree of protection against the competition of foreign producers. We must recognize that many of the foreign mines have the advantages of higher metallic content, lower wage rates and fewer legislative requirements which add to their costs of operations, and that modern machinery and engineering talent are readily available to them. Unless these advantages are offset by tariff rates at least equal to those determined upon in 1922 and maintained in 1930, many of our domestic mines face the prospect of shut-downs and unemployment. In discussing this subject as it relates to an important group of minerals, Elmer Pehrson, Chief of the Economics Branch, U. S. Bureau of Mines, recently stated in a public address:

> "Drastic changes in import duties, therefore, would seriously injure the competitive position of domestic producers and result in extensive unemployment in our metal mining areas and depression in the regions surrounding them. Because mining is usually the only occupation in the region, the problem of stranded population can be anticipated. For two decades before this war, we struggled with a similar situation in our coal mining regions, and our experience during that period with bootleg conditions and other consequences of the distress in these areas should cause us to go slow in inviting more."

Mr. Pehrson advocated that pre-war tariff rates on these minerals be

Zinc ore from the stopes of New Jersey Zinc Co.'s mine at Franklin, N. J., on its way to various reduction operations to prepare it for the marts of trade

guaranteed for at least five years following the war.

In some quarters apprehension has been expressed over the depletion of known ore reserves in this country as a result of heavy production during the war. The thought has even been suggested that we should conserve our resources by shutting down our own mines and importing our requirements from abroad. Such a suggestion, however, ignores several fundamental factors.

The conserving of mineral resources is not accomplished by shutting down mines, by allowing them to cave and fill with water so that much of the ore can never be recovered, by scrapping the mining plants and treatment facilities or allowing them to deteriorate, by scattering established technical and operating organizations, and by uprooting whole communities. Such a procedure does not conserve but may destroy our mineral resources. Additions to our mineral reserves are largely developed *in the process of mining*, and advances in the techniques of ore finding, mining, and metallurgical treatment are made by strong and active mining organizations. Without such organizations and a "going" mining industry, resources in the ground would have no practical value in a national emergency, as it would take too long to bring them into production.

As a result of the magnificent contribution made by our mines to the winning of this war, it is true that blocked-out reserves at many mines have been reduced below normal. In large part, this has been due to the acute shortage of manpower, which has compelled mine operators to take men off development work and to put them on production. The normal policy of developing new reserves to keep pace with ore extraction has had to be neglected. But even before the war, for a period of some ten years, a combination of low prices, high taxes, legislative requirements, and the constant threat of lower duties and intensified foreign competition as a result of the administration of the trade agreements program, had discouraged enterprise and largely removed any incentive to undertake the risks of exploring for new ore bodies. The answer to the present problems of the industry is not to put our mines out of business and to import our requirements; rather it is to again create conditions that will permit our mines to operate—that will afford the incentive needed to justify the application of modern prospecting methods, and the heavy expenditures which must be made to find and develop new mines, together with persistent research in devising and perfecting the processes whereby lower grade and hitherto worthless deposits may be utilized.

The suggestion that our mining industries be allowed to die while we meet our needs from abroad was likewise discussed by Mr. Pehrson in the address I have referred to. Mr. Pehrson said:

> "From a theoretical viewpoint this argument has appeal, but from a practical standpoint the cost is too great. It imposes too severe a burden on the present generation by asking it to swap a bird in the hand for only one crippled bird in the bush to be saved for the use of future generations. The program would result in resource waste because much of the unmined portions of deposits now developed probably never could be recovered after a prolonged shut down. Also, the abrupt curtailment of mining would present a serious social problem in readjustment of the population that would be stranded in isolated mining areas. Huge capital losses would be incurred. For these reasons, the proposal does not seem to merit serious consideration."

* * * *

The policies determined upon by Congress in the pending legislation will vitally affect the future of important branches of mining in this country. We believe that the amendments we have suggested are to the best interests of our country and represent sound policy in dealing with the problems that lie ahead. We solicit your earnest consideration of these amendments.

Chester Vein System Shows Rapid Development

THE Chester vein system in the Coeur d'Alene District of Idaho is rapidly developing into the largest and richest body of silver-lead-copper-antimony mineral that has been found in the United States during the past 30 years. Four different mining companies, Polaris, Sunshine, Silver Dollar, and Silver Syndicate, directly benefit from the discovery, while the entire district receives indirect benefit through publicity.

Some idea of the size and richness of this strike can be gained through a study of the annual report of the Silver Dollar Mining Company for the year 1944. The Silver Dollar Company owns only a one-third interest in the production from 400 ft. out of a total of 6,200 ft. owned by the other companies. Silver Dollar's share out of this small interest has been sufficient during the past two years to pay its stockholders $40,000 return on assessments formerly levied and pay new development work on other parts of the company's property. Silver Dollar's part of the earned profits from this small block of ground for the year 1944 totaled $242,370.57. The ore produced from the small area, according to E. G. Gnaedinger, engineer and mine manager for the company, totaled 16,600 tons for the year 1944 and most of it came from development work and with short crew of miners. This tonnage averaged a mill feed of 2.65 percent lead and 61 oz. in silver per ton, having a value of $43.30 per ton. The total amount of metals produced out of this tonnage was approximately 1,011,000 oz. in silver, 894,000 lb. of lead, and 231,000 lb. of copper. Ore reserves in sight in the area are estimated at 158,280 tons.

Adjoining this area on both the east and west ends the Polaris Mining Company owns 1,800 ft. of ground, which is as equally rich and productive as the Silver Dollar section, known as the "Rotbart" area, in which Polaris and Sunshine also own a third interest each. The Polaris Company's part of the vein is known as the "Omega" area, the profits from which are shared with Sunshine. Profits from this area during the past two years has enabled the Polaris Company to declare dividends totaling $800,000.

Adjoining the Polaris Company's "Omega" area on the west is what is called the "Rambo" area, consisting of 4,000 ft. on the strike of the vein, and which is owned by Silver Syndicate and Sunshine Companies on a 50-50 basis. Because of a scarcity of men only development work has been attempted in this area but the same high grade ore bodies have been opened and made ready for stoping and diamond drill operations in the same area 2,500 ft. further west indicate a continuation of the ore in size and rich mineral content.

Because of the importance of this ore body, owing to its lead and copper content, Sunshine has temporarily stopped production and development on several important mineral veins of its own and is devoting every effort to the new ore body which has produced during the year 1944 and up to date this year a total of $744,410 in dividends for the Sunshine Company stockholders.

This ore body has recently been opened on the 3,700-ft. level, 1,000 ft. below sea level and 600 ft. below the 3,100-ft. level, where most of the former exploratory work has been done. On the new 3,700 level the vein shows a width of 8 to 9 ft. with average assays running from 100 to 400 oz. of silver per ton.

Underground Formation and Suppression of Coal Dust

A Report of the Committee on Coal Dust Abatement

By D. H. DAVIS
Chairman

★ ★ ★

Part I—Methods of Water Spraying on the Working Face and Data on Wetting Tests

IN presenting this report, it is the opinion of the committee that the technique for dust abatement in coal mining has not yet been developed to the point where standards can be set up, either for equipment, practices or specifications. Methods to prevent the formation of dust or to suppress it at the source have been in use for some time; the application of water during certain of the mining operations is quite widespread throughout all fields, but there are still a number of problems where solution is needed. The subject is one that requires detailed study and it is the desire of the committee to enlist the cooperation of men and companies who will furnish accurate data on methods and results. This program is now underway and the report presented here gives a resume of some studies that have already been made and some test data that was offered to the committee for their use.

Sources of Underground Dust

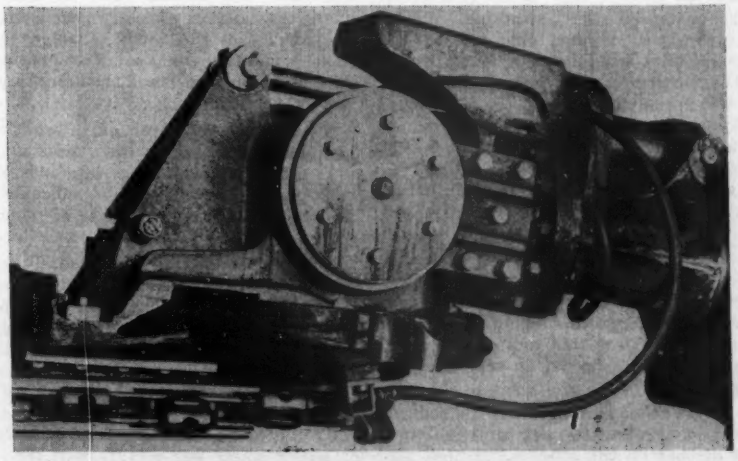
The various sources of underground dust in coal mining may be classified as primary or secondary. A primary source is one associated with appreciable degradation of size, that is, where the greater part of the actual fines capable of becoming air-borne dust are produced. A secondary source may be considered as one in which the greater part of the fines have been produced at some previous operation and are in such condition that they can be dispersed as air-borne dust. These conceptions appear to be of practical significance, as experience indicates that when dust is controlled at the primary sources the importance of secondary sources is minimized. All dust sources produce both primary and secondary products but in the following tabulation, an attempt has been made to indicate which type of dust is predominant.

1. Undercutting—majority of dust produced is of primary nature.
2. Drilling—primary source.
3. Blasting or shooting of coal. Information not conclusive as to whether most of the dust is of primary or secondary nature.
4. Loading—secondary source.
5. Underground transfer points—secondary source.
6. Transportation—secondary source.
7. Miscellaneous—gobbing, timbering, cleanup, high air velocity, movement of machinery and materials are all secondary sources.

Factors Affecting Dust Formation

The type of cutting machine, that is, whether it is a shortwall or a universal, greatly influences the production of dust. The cuttings produced by the shortwall machine are pulled out by the cutting chain on the mine floor in such a manner that sprays can be effectively placed to trap and thoroughly wet the dust produced. On the other hand, cuttings from the universal machine fall some distance to the floor, depending on whether it is shearing, top cutting, or center cutting, but in practically all cases under comparable conditions, a greater quantity of dust is produced than with a shortwall.

The cutting speed is another factor in dust production. The faster the rate of cutting, the higher will be



Water hose for spray nozzles on universal cutter bar

the dust concentration for any particular condition and more water is required to effectively reduce the dust. For instance, one make of machine has an average cutting speed of 1.41 minutes per foot and under certain conditions produced an average dust concentration before spraying of approximately 160 million particles per cubic foot. Another make of machine has a cutting speed of 0.67 minutes per foot and this produced an average of 287 million particles per cubic foot of air before spraying. With higher speed on a shortwall it is more difficult for the scraper to shovel the cuttings from the machine and if these are not removed, they recirculate back into the kerf where they are reground and produce a greater quantity of extreme fines. In order to overcome this objection in the higher speed shortwall cutting machines and to facilitate cleaning of the kerf, one manufacturer has a slack conveyor for removal of cuttings from the tail sprocket. Dull bits are also the cause of greater dust concentrations than where the bits are newly sharpened.

Drilling—Few dust studies have been made on drilling but results of these indicate that drilling produces a relatively small point of dust compared with cutting.

Blasting, as a primary source of dust production is probably of lesser importance as compared to cutting and is affected by the friability of the coal, the character of the cleats, and the type and quantity of explosive used. As a secondary source, the effect of blasting is greatly lessened by sprinkling during the undercut and is mostly eliminated if the machine cuttings are thoroughly removed from the kerf before shooting. In pillar work where there is pressure on the coal, more dust is produced when blasting than in solid work.

Loading is largely a secondary source and it has been effectively demonstrated that spraying during cutting will dampen dust to such an extent that a negligible amount is produced during hand loading, whether into mine cars or on to conveyors. Some recent tests show that a reduction of 61 percent in the dust concentration during mechanical loading, resulted from sprinkling the cut using water without a wetting agent.

Haulage, especially at high speed, can cause the formation of air-borne dust but practically all of this can be suppressed by top spraying the loaded trips. Underground dumps may be adequately protected against dust by sprinkling, by hoods, or separate air splits.

Ventilation can be made to reduce dust concentration per unit volume of air but on the other hand high air velocity in entries tends to keep the dust stirred up. If the working places are provided with sufficient air to maintain a safe atmosphere, the ventilation will usually dilute any minor dust formed in gathering, timbering and other auxiliary operations.

Water Spraying

Water can be added during certain operations in the mining of coal to reduce the amount of fine coal dust that would otherwise go into suspension but this objective can not always be attained by the "garden hose" method of application. Hose sprinkling, besides being ineffective per gallon of water, uses such large quantities of water that the quality of the coal is usually adversely affected. The delivered B.t.u., handling characteristics, necessity for fine screening within specified limits, and the efficiency of air cleaning are all affected adversely by the addition of excessive amounts of moisture to the coal. The use of a hose generally produces an amount of water in excess of that absorbed by the coal and in many cases this excess water causes harmful results in the working places or nearby haulage due to deterioration of the bottom and track, heaving, and sloppy conditions.

Water has the same effect on the heat value of coal as impurities and it is estimated that there is a loss of 0.33 percent in combustion efficiency for every 1 percent increase of moisture or ash.

Some consideration must usually be given to the quantity of water that may be sprayed without harmful effect on the marketing of the coal and in this the operator faces a realistic consumer who does not desire to pay for excessive moisture. When producing cuttings at a rate of 300 lbs. per minute, the addition of 1.5 gallons of spray water per minute will theoretically raise the moisture content of the cuttings by 4 percent if it is assumed that all the water is added to the cuttings. Actually, however, all of the water sprayed is not absorbed by the cuttings, some falls to the floor while some strikes the coal face and thence to the floor. In one instance where approximately 0.5 gallon water per ton was being sprayed on a shortwall cutter at the rate of approximately 1.0 gallon per minute, there was an increase of approximately 1.5 percent free moisture in the cuttings. If the water is evenly distributed it appears that in shortwall cutting up to 1.5 gallons per minute and in universal cutting up to 2.5 gallons per minute could be sprayed without excessively increasing the moisture content of the fine coal. In the above, it is assumed that there was little or no free moisture present before spraying.

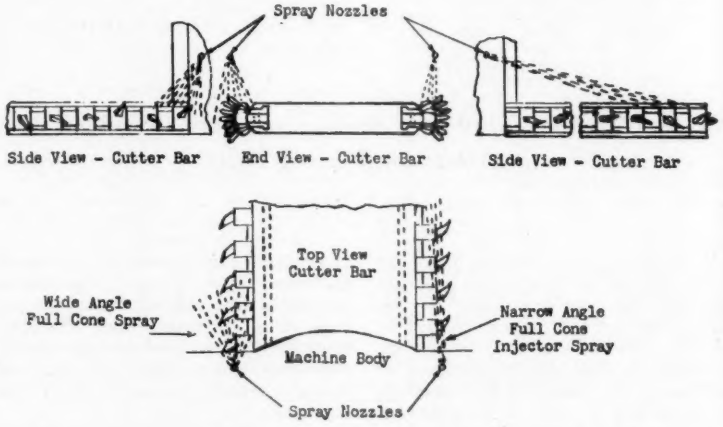


Fig. 1. Showing location of spray nozzles with respect to cutter bar and chain

Method of Spraying the Undercut

For the purpose of spraying while cutting, shortwall and universal mining machines of all manufacturers have been equipped with sprays located on either side of the cutter chain in the front of the machine (see illustration). Usually there are two spray nozzles per machine and in the case of the shortwall both the right and left-hand sprays are located approximately 6 in. above the cutter bar and slightly to the outside of the cutter chain. It has been found best to have the sprays mounted in a recess within or under the armature casing in order to give protection to spray nozzles and when a recess is not available, special guards or hoods have been built.

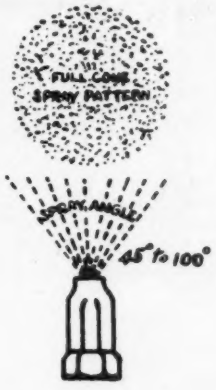
Looking toward the working face, the right-hand (ingoing chain) spray should be narrow angle (18°) so directed that the water suppresses the dust produced at the end of the bar

HOLLOW CONE SPRAY

Pressure: 10 to 100 p.s.i., preferably over 60

Gallonage: 0.36 to 5.0 g.p.m.

Application: On cutting chain at point of entering or emerging from kerf



FULL CONE SPRAY

Pressure: 10 to 150 p.s.i., preferably over 60

Gallonage: 0.25 to 10 g.p.m.

Application: On cutting machines, loading machines, conveyor loading and discharge points, rotary and end dumps

FLAT ATOMIZING SHEET SPRAY

Pressure: 10 to 100 p.s.i., preferably over 50

Gallonage: 0.2 to 8.0 g.p.m.

Application: At belt loading heads on under side of conveyor discharge

NARROW CONE SPRAY

Pressure: 10 to 300 p.s.i., preferably over 75

Gallonage: 0.35 to 13.7 g.p.m.

Application: On cutting machine for injecting water into the kerf

Fig. 2. Types of spray nozzles for underground dust suppression

when sumping; when cutting across the face, the water strikes the face immediately above the chain and thus is carried to the back of the cut. (See Fig. 1). On the left side (emerging chain) there is either a flat sheet spray or full-cone spray located so that it brackets the stream of cuttings as they are carried out by the cutter bar. (See Fig. 2). The application of spray water from these two points allow a certain safety factor in that if one spray clogs, considerable dust reduction will still be effected by the other. However, both are needed to effect greatest reduction in dust. Also in these positions, the sprays are accessible for inspection and repair and can be protected against damage. Lastly, and very important is that the operation of the sprays at these points is not affected by the manner in which the cutting machine is operated in respect to the removal of cuttings. A spray located at the tail sprocket is very effective as long as the cuttings are completely removed as fast as produced, but is ineffective if the cuttings pile up at the sprocket.

Regardless of the method of supplying water under pressure to the nozzles, the spray installation on the cutting machine may be similar. One-quarter-inch pipe or better hydraulic hose is extended from each nozzle either alongside or over the top of the machine to a convenient point at the top or back of the machine. At the end of the line is a valve and a hose

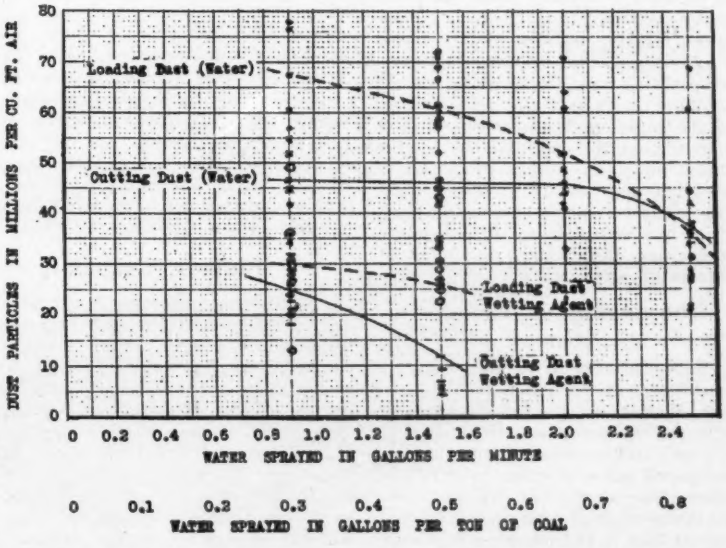


Fig. 3. Graphs showing the relation between quantities of water sprayed on cutting machine bar and the reduction of coal dust from the mine air during the cutting and loading operations

connection; a "Y" type strainer may also be located at this point. The hose connection provides a simple and quick connection between spray installation on the cutting machine and the source of the water. While the machine is tramming, the hose is coiled and placed on top of the machine. Protection of the piping and nozzles is of paramount importance as the entire spray system depends on keeping these parts in operating order. The valve, hose connection, and strainer should also have a hood for protection against damage.

Effect of Wetting Agents

Test by air samples and dust counts were made by a coal company in one of its mines to determine the effect of spraying during the undercut and also the benefits of using wetting agents. The sprays were located as described in the previous paragraph. The seam is 5½ ft. in thickness and was cut by a shortwall cutter (9-ft. bar) and loaded by a tractor-type loading machine. Dust counts and other data were taken on four types of tests as tabulated below:

1. Cutting without water.
2. Cutting with plain water.
3. Cutting with water and wetting with agent A.
4. Cutting with water and wetting with agent B.

DATA ON DUST REDUCTION TESTS
(Also see Fig. 3)

Test	Wetting Agent	Percent of Wetting Agent	Water sprayed per ton coal	Amt. of Wetting Agent per ton coal	Cost of Wetting Agent per ton coal	Millions of dust particles per cu. ft. air		Percent of dust reduction over plain water	
						Cutting	Loading	Cutting	Loading
(1)	No water...	....	.....	.....	....	338.0	176.0	....	....
(2)	Plain water.	....	0.30 gal.	.....	....	46.9	68.0	....	....
(3)	Agent A....	0.050	0.30 gal.	0.001 lb.	0.16c	24.5	34.7	48.0	47.0
(4)	Agent B....	0.300	0.30 gal.	0.008 lb.	0.10c	13.0	14.6	72.0	64.0

Dust counts are influenced by a number of factors such as air velocity, position of sampler, and variations in cutting and loading rates. Therefore, the results must be taken to be relative, not absolute. However, a number of samples were taken for each condition and the average of all samples for each condition was used in assessing the results.

Using water with a 0.05 percent concentration of Agent A at the rate of 0.3 gallon per ton of coal sprayed during undercutting gave a reduction in dust concentration during cutting of 48 percent over plain water at a cost of 0.16 cents per ton of coal while the use of a 0.30 percent concentration of Agent B sprayed at the same rate gave a reduction in dust concentration of 72 percent over plain water at a cost of 0.10 cents per ton of coal. During loading, the dust reduction with A was 47 percent and with B it was 64 percent over plain water.

NOTE—Part II of this report will appear in an early issue and will describe methods and costs of underground water distribution to working places.

Mine Drainage

(*Continued from page* 34)

cooperative effort of operators either through a tunnel-company system or through a governmental-financing system by which the capital cost could be spread through the life of the properties, drainage tunnels are the long-range solution of drainage problems in the lower fields. Given an optimum of operating time, the balance between pumping costs and the amortization of the high capital investment of a tunnel, plus the maintenance of the tunnel, must be closely compared to establish the economy of tunnels; however, given a short operating time, which has been a factor in anthracite production, the balance in favor of tunnels is apparent.

Dewatering of Flooded Mines

The dewatering of flooded mines is not uncommon in the anthracite region. The reason for dewatering may be to remove water caused by drownouts or to remove water impounded in abandoned mines in order to work the mines safely or recover coal reserves. The dewatering of mines is a very important item in the pumping problems of the region.

In view of the high cost involved in pumping water or providing drainage tunnels, considerable effort is constantly expended to prevent surface waters from seeping into the ground or entering through crevices and stripping cuts into underground workings.

The basic method is to collect surface water in earthen ditches and conduct it around outcrops and stripping cuts. Where ditches must cross areas known or believed to be porous, they are paved and concreted to make them watertight. In places where subsidence is inevitable, steel or wooden flumes are often installed, which permit regrading from time to time. There are times when such flumes have to carry immense quantities of water, and they are therefore installed for such maximum demands.

Flumes Needed

Flume construction is in use in all fields; however, there are numerous abandoned properties which should be treated similarly, but to do so is beyond the financial ability of the industry. In spite of these extensive and expensive measures, huge quantities of water still find their way into active and worked-out mine workings. In the latter case, vigilance must be exercised so that impounded water will not become a potential hazard to life and property. Adjacent mining operations may suddenly cause a barrier to collapse, bringing about sudden inundation of active workings with catastrophic results.

Not only are millions of dollars spent annually to protect the mines from the inflow of surface water, but millions of tons of coal are also irrevocably lost in protective pillars in order to protect life and property from sudden floods, inrushes of water due to floods, or breaks in the surface strata.

Conclusion

Owing to the magnitude of the work required, diversity of interests of the coal and surface ownerships, hazard to the whole mining community, and interests affected outside the mining region, the mine-drainage problem cannot be remedied by the operating companies without State or Federal aid, or both. The costs of abating the ever-increasing surface seepage to mine workings and of handling this seepage once it has occurred are beyond the economic resources of the operating managements.

To remedy the conditions which face the industry will cost 100 million dollars. Such an expenditure for the future well-being of the industry would be a sound investment for the Federal Government, the State of Pennsylvania, the mining companies, and the 1¼ million people who depend on this industry for their livelihood.

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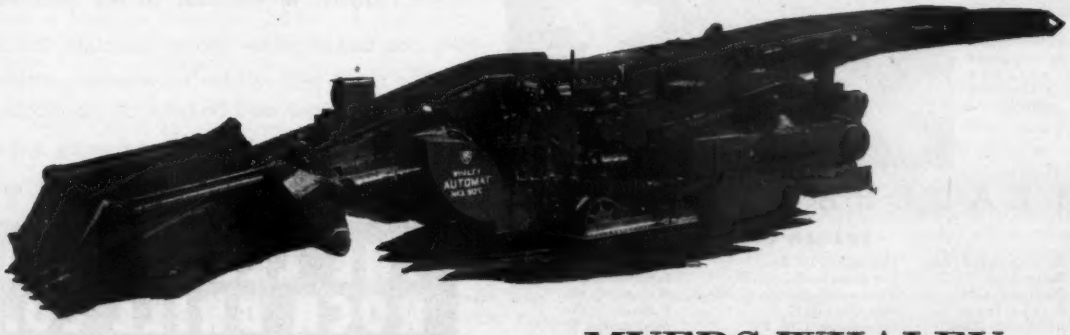

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WHEELS OF GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

COMPLETE DEFEAT and occupation of Germany and the consequent multiplication of the blows against Japan, now bereft of its Navy and transport fleet, are bringing the nation much closer to the end of a state of war. The President has entered well upon his task by proceeding with a reorganization of his cabinet, which now carries quite a western atmosphere with Postmaster General Hannegan of St. Louis, Attorney General Tom C. Clark of Texas, Secretary of Agriculture Clinton P. Anderson of New Mexico, Secretary of Labor Lewis D. Schwellenbach of Washington, Federal Loan Administrator John W. Snyder of St. Louis, Secretary of Commerce Wallace and Secretary of Interior Ickes.

Foreign Trade Agreements

As Senate Finance Committee hearings closed on the Doughton bill, to extend the authority to negotiate reciprocal foreign trade agreements for three years and to permit reductions of 50 per cent in the rates of duty existing on January 1, 1945, full administration pressure was turned on to accomplish enactment of the measure by June 12, the expiration date of the present law.

During the House Ways and Means Committee hearings Secretary Julian D. Conover of the American Mining Congress urged a limitation of one year on any extension of the act and asked that no additional authority to reduce tariff duties by executive action be granted. He particularly stressed the need of a sound and healthy mining industry for national defense. As passed by the House the bill included an amendment by Representative Clinton Anderson of New Mexico, to prevent the use of any temporary rate of duty as the base for an additional 50 percent cut.

Presenting the position of the State Department at the opening of the Senate Finance Committee hearings, Assistant Secretary of State Will Clayton claimed that no single American industry could show that it had been seriously hurt through the making of trade agreements. He asserted that the making of further tariff concessions by trade agreement officials would call for the exercise of vigilance in safeguarding American industry.

The Mining Congress secretary was the first witness for the mining industry, urging that the Doughton bill be amended so that strategic and critical minerals and metals would be excluded from duty reductions. He voiced the approval of the industry for the "Bailey Amendment," sponsored by the Senator from North Carolina, which reads: "No proclamation shall be made pursuant to this section decreasing the duty or other import restrictions on any mineral or metal included in the 'Current List of Strategic and Critical Materials' approved by the Army and Navy Munitions Board November 20, 1944 (Table II, Senate Document No. 5—79th Congress, 1st Session)."

Further mining witnesses before the committee were Felix E. Wormser, secretary-treasurer, Lead Industries Association; Otto Herres, vice president, Combined Metals Reduction Company; E. V. Gent, secretary, American Zinc Institute; and O. W. Bilharz, manager, Bilharz Mining Company and president of Tri-State Zinc and Lead Ore Producers Association.

Gold Reserve—Bretton Woods

The House, following similar Senate action, has approved the Wagner-Spence gold reserve bill which reduces to 25 percent the gold reserve required to be held against Federal Reserve Bank notes and deposits. Efforts on the part of Western Congressmen to hold the reduction at 30 percent and limit it to two years were unavailing; also defeated was an amendment offered by Representative Clair Engle of California which would have increased the price of gold to $56 an ounce.

Late in May the House Committee on Banking and Currency reported the Bretton Woods bill under which the government is authorized to participate in the $9,100,000,000 World Bank for Reconstruction and Development and the $8,800,000,000 Monetary Stabilization Fund. Soon to be considered on the House floor (there has been no action in the Senate) the measure does carry an amendment making long-term currency stabilization loans a function of the bank. Under the amendment the fund will handle only short-term currency transactions; other amendments establish a National Advisory Council on international monetary and financial problems "to coordinate the policy and operation of the representatives of the United States on the fund and the bank and for all

Washington Highlights

CONGRESS: May begin summer recess in mid-July.

TRADE AGREEMENTS: "Bailey amendment" would exempt strategic minerals.

GOLD RESERVE: Both Houses approve reduction to 25 percent.

L-208: WPB announcement expected soon.

S. 502: Conferees to meet on metal premiums.

OPA EXTENSION: Meeting determined efforts at amendment.

ANTHRACITE: Wage agreement completed.

WAGE-HOUR: Hearings set on Gwynne bill limiting "damage" suits.

SUPREME COURT: Jewell Ridge counsel asks rehearing on "portal-to-portal."

FERTILIZERS: Legislation would put Government in business.

agencies of the government which make or participate in making foreign loans or which engage in foreign financial exchange or monetary transactions," and consolidate the offices of fund and bank governor. Treasury officials advise that none of these amendments will require a further international conference.

L-208

An announcement is now expected by mid-June which will set forth the policy of the war agencies on the rescinding of the gold mine closing order L-208, which has now been in effect for more than two and one-half years. It is to be hoped that the continued efforts of the American Mining Congress and of Senators and Representatives from gold producing states will bring about the lifting of the order, so that the gold mines may furnish employment for some of the men released by the cutbacks in manufacture of war munitions.

Meanwhile there is an aggravated situation in the remote Alaskan mines which thus far have been unable to secure the release by WPB of equipment and tools with which to resume operation one year from now in the season of 1946. This equipment must be loaded on boats at Seattle, bound for Bering Sea and Yukon River points, by July 15 in order that it may be transported over the ice this coming winter to points of destination. Soon after the Japanese attacked this country the miners of Alaska turned over their tractors, draglines and other equipment to the War Department and they are asking that restitution be made now, before the industry is crippled through the loss of its workmen.

Premium Price Plan

Reported early in May by the House Committee on Banking and Currency, the Hayden - McFarland bill, S. 502, which would continue the Premium Price Plan on copper, lead and zinc to June 30, 1946, was passed by the House on May 28 and has been sent to conference. Conferees for the Senate are Murdock, Utah; McFarland, Arizona; Taylor, Idaho (Dems.); Taft, Ohio; and Millikin of Colorado (Reps.). For the House are Spence, Kentucky; Brown, Georgia; Patman, Texas (Dems.); Wolcott and Crawford, Michigan (Reps.). The conferees are not expected to meet until mid-June.

As reported to the House the bill eliminates Senate language making all classes of premiums non-cancelable and it is this very important feature, which remains intact in the Senate version of the bill, which is expected to be a primary matter for consideration by the conferees.

OPA Extension

Long delayed by the bitter controversies waged over meat and food pricing practices, the bill extending the Price Control and Wage Stabilization Acts was reported on May 29. Senator Taft of Ohio is expected to make determined efforts to amend the measure when it is considered on the Senate floor. The Banking and Currency Committee report on the bill is expected to discuss a number of administrative matters including the recognition of percentage depletion allowances in computing coal and other mineral costs.

Anthracite Wage Agreement

On May 19 the anthracite operator-miner wage conference agreed on an average pay increase of $1.37½ per day. Broken down this amounts to $1.132 per shift for underground employes' travel time for 45 minutes per day at a rate of $1.006 per hour at rate and one-half; shift premiums of 4 and 6 cents for the second and third shifts; increase in vacation compensation from $50 to $75; and overtime payments at rate and one-half for all hours in excess of seven hours in any one day or 35 hours in any one week.

Interesting in this connection is the ruling of the U. S. Supreme Court in early May on the Jewell Ridge Coal Corporation case, affirming the Circuit Court's ruling that underground travel time in bituminous coal mines was included in the compensable workweek within the meaning of the Fair Labor Standards Act. Counsel for Jewell Ridge on May 31 filed a brief petitioning for a rehearing on the decision and questioned the propriety of Justice Black's participation in the case because of "his connection with the subject matter" and with the chief counsel for the miners, Crampton Harris of Birmingham. The brief further states that "The record of the proceedings indicates that Mr. Justice Black was the most active and prominent sponsor of this bill in the Senate until his appointment to this court. He made statements pertinent to the issue here presented and which this court found necessary to interpret in deciding the case. He participated in this court's consideration and interpretation of his statement."

Wage-Hour Legislation

Recent court decisions on "back pay claims" under the Wage-Hour Act have directed attention to a bill introduced by Representative John W. Gwynne of Iowa on which hearings will begin June 11 before a House Judiciary Subcommittee consisting of Representatives Sam Hobbs, Alabama; Michael A. Feighan, Ohio; Frank L. Chelf, Kentucky (Democrats); Clarence E. Hancock, New York; Raymond F. Springer, Indiana; and Frank Fellows, Maine (Republicans). As introduced the measure would provide a limitation of two years for public suits and one year for private suits under Federal laws (after such cause of action accrued, unless a shorter time be fixed in any applicable state statute).

In this connection L. Metcalfe Walling, administrator, Wage and Hour and Public Contract Divisions, Department of Labor, has suggested "a reasonable statute of limitations" saying that, "if this is done, varying state standards, which penalize some workers in the collection of wages legally due and give competitive advantage to violators in states with arbitrarily lowered statutes of limitations, will no longer prevail."

In its report on the Labor Department appropriations bill the House Appropriations Committee has called for legislation to restrain the payment of excessive "double damages" saying "The liquidated-damage provision, was, no doubt, intended to be helpful in establishing and maintaining the minimum wage and perhaps has had a salutary effect. It appears, however, in some instances that advantage has been taken of this mandatory provision to the detriment of innocent employers, and in other cases violations have been permitted to continue in order to collect the increased amount provided as liquidated damages. In view of such situations it is suggested that the proper legislative committee give consideration to whether or not an amendment to the statute is needed which would provide fair protection to employers."

Government Fertilizer Industry

Significant as are the new Department of Interior Regulations governing potash exploration permits and leasing, discussed on page 136 of our February issue, the evident intent in the various Valley Authority bills to put the government in business is now crystallized in the Bankhead-Hill (Dems., Ala.) bill, S. 882, which is seen as creating a very real obstruction to private acquisition of phosphate and potash deposits on public domain lands. Section 601, Title VI of S. 882 reads "The remaining reserves of phosphate and potassic minerals in the public domain are hereby declared to be essential to the public interest in the conservation and maintenance of the nation's soil resources and it is hereby declared to be the policy of the Congress that said reserves shall be held by the government as a public trust in perpetuity and primarily for the pur-

(*Continued on page 73*)

PAYROLL SAVINGS PLAN

NOW'S THE TIME FOR *Your* BIG "MOP-UP"!

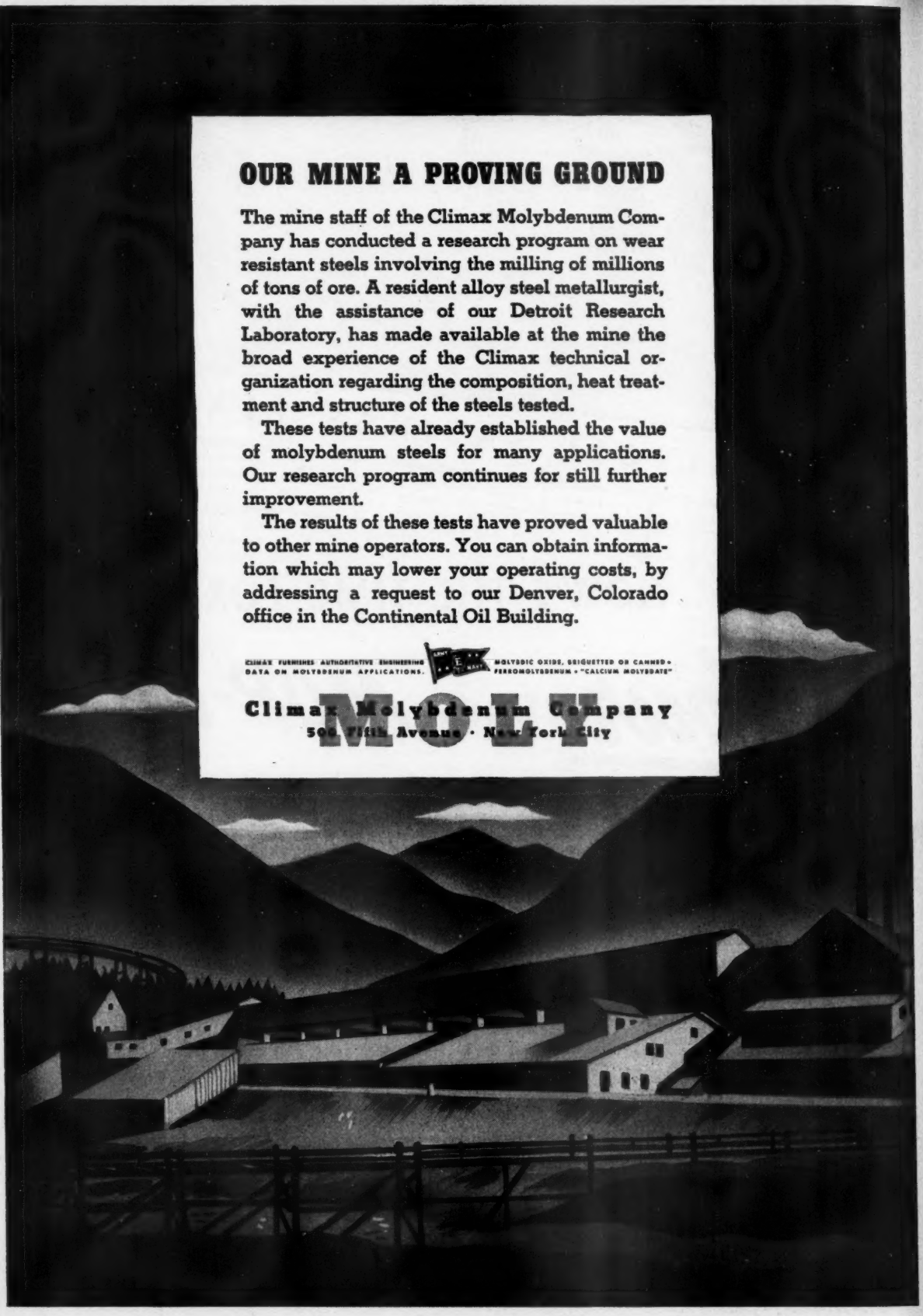
RE-SOLICITATION is the keynote for a victorious "mop up" in the Mighty 7th War Loan. Bond rallies plus continuous competition between departments help to keep Bond subscriptions on a quota-topping climb. Strategic poster displays . . . showings of "Mr. & Mrs. America," the Treasury film . . . distribution of the War Finance Booklet, "How To Get There," and the handy Bond-holding envelopes play an important part. But, above all else, arrange to have every employee asked *once more*—and personally urged *once more*—to meet his personal quota in the Mighty 7th!

The Payroll Savings Plan is the mainstay of every War Loan—meeting your plant quota is vital to the success of the 7th! Remember we have to make two drives in 1945 do the work of three last year. Put on an intensive "mop up" final to help mop up the Japs, cut the tentacles of inflation—and lay the foundation of security.

The Treasury Department acknowledges with appreciation the publication of this message by

MINING CONGRESS JOURNAL

★ *This is an official U. S. Treasury advertisement prepared under the auspices of Treasury Department and War Advertising Council* ★



OUR MINE A PROVING GROUND

The mine staff of the Climax Molybdenum Company has conducted a research program on wear resistant steels involving the milling of millions of tons of ore. A resident alloy steel metallurgist, with the assistance of our Detroit Research Laboratory, has made available at the mine the broad experience of the Climax technical organization regarding the composition, heat treatment and structure of the steels tested.

These tests have already established the value of molybdenum steels for many applications. Our research program continues for still further improvement.

The results of these tests have proved valuable to other mine operators. You can obtain information which may lower your operating costs, by addressing a request to our Denver, Colorado office in the Continental Oil Building.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS. MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

MOLY

Climax Molybdenum Company

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Personals

Pearson E. Neaman, New York attorney, has been elected a vice president of Freeport Sulphur Company and its subsidiaries, including Cuban-

American Manganese Corporation and Nicaro Nickel Company.

Mr. Neaman is a member of the law firm of Battle, Levy, Fowler and Neaman, and since 1930 has been secretary of Freeport Sulphur in charge of all legal activities. He will continue in charge of legal affairs and as a member of the law firm.

The following changes have been announced by President **William J. Jenkins** in the official staff of the Consolidated Coal Company:

G. S. Jenkins, formerly assistant general manager, now vice president, in charge of operations and purchasing; **R. L. Douglass**, formerly general sales agent, now vice president, in charge of sales; **Norvin H. Vaughan**, formerly assistant general sales agent, now general sales manager; and **Carl F. Reece**, formerly sales representative, now assistant general sales manager.

After almost two years service as lieutenant in U. S. Navy Aviation and receiving honorable discharge, **Ralph M. James**, sales promotion manager, returns to his former work, with headquarters at Davenport, Iowa.

Philip D. Wilson, formerly vice chairman for metals and minerals of the War Production Board and more recently special assistant to Chairman **J. A. Krug**, has resigned to become assistant to the president of Baker & Co., Newark, N. J. Mr. Wilson became identified with the WPB in 1941 as head of the Aluminum and Magnesium Division.

J. Campbell Stras, president, Kentucky Cardinal Coal Corp., was recently elected president of the Weyanoke Coal & Coke Co., which has mines in Mercer County, W. Va. He succeeds **R. D. Patterson**, deceased. **George F. Mash**, superintendent of mining operations, was promoted to vice president and general manager, and **Harry E. Cohn** was elected a director.

Charles C. Keith has been appointed mine inspector for the state of Missouri to succeed **John A. Skinner** who resigned recently to become vice president in charge of mine operations for the Wentworth Mining and Milling Co., in the Tri-State area.

Alfred Kauffmann, retired president of Link-Belt Company, was elected a director of the Gardner-Denver Company at the annual stockholders' meeting held in the company's Quincy offices on Tuesday, March 27. Mr. Kauffmann succeeds **P. H. Gardner**, who has resigned his directorship, because of ill health.

J. R. Linney, district manager of the combined northern New York mining operations of the Republic Steel Corporation, has resigned to enter the consulting field. **R. J. Linney** has been appointed district manager of the Port Henry district and **W. J. Linney** will be district manager of the Chateaugay district.

William Ford, formerly associated with the Alma Fuel company and the Basin Coal Company in West Virginia, has been appointed superintendent of mines 3 and 8 of the Eastern Coal Corporation at Stone, Ky.

Karl G. Link, who joined the staff of the Aluminum Ore Company in E. St. Louis two years ago, has been made technical supervisor. In this capacity, he directs operation of chemical charging of the $13,000,000 sintering plant built and operated by the Aluminum Company for DPC for extraction of additional alumina from the rejects of the Bayer process.

Two recent appointments in General Electric's Industrial Divisions by Karl H. Runkle, manager, name J. J. Huether assistant manager of the Industrial Divisions, and W. A. Wirene

manager of the Industrial Materials Division, Industrial Divisions.

Mr. Huether had been manager of the Industrial Materials Division for eight years, with Mr. Wirene as assistant manager since 1942.

Harris B. Salisbury, formerly with the Ore and Chemical Corporation, has become mill superintendent of the Western Gold Mines, Inc., at Crown King, Ariz.

Dr. J. R. Van Pelt, Jr., noted for his educational pioneering, and until recently technical director of the Mu-

seum of Science and Industry, in Chicago, has joined the staff of Battelle Memorial Institute, Columbus, Ohio. According to an announcement by **Clyde Williams**, Battelle director, Dr. Van Pelt will head Battelle's program of research education.

R. L. Littlefield, formerly night foreman at the Boothton No. 2 mine of the Boothton Mining Company, was recently promoted to the position of assistant superintendent and safety engineer.

Appointment of **John Walker** as manager of the Sales Engineering Dept. of Mack-International Motor Truck Corp., has been announced by **C. T. Ruhf**, president of Mack Trucks, Inc. Mr. Walker, who has had wide experience in applying special engineering principles to unusual transportation problems, will make his headquarters in Mack's executive offices in New York's Empire State Building.

M. L. Workman, of Beards Fork, W. Va., was recently made general superintendent of the Glen White,

Helen, Long Branch, Stotesbury No. 8 and Stotesbury No. 11 mines of the Koppers Coal Division of Eastern Gas and Fuel Associates. His offices are at Glen White. He has been with Koppers Coal since 1923.

George C. Heikes, director of the Aluminum and Magnesium Division of the War Production Board since July, 1944, has resigned to join the staff of Ventures, Ltd. He has been replaced by **Nigel H. Bell** of New York who has been with the Division since November, 1942, and until recently was chief of the Division's fabrication branch.

Arthur Kendall, formerly general manager of the Bagdad Copper Corporation at Bagdad, Ariz., will soon leave for Canada to take over a new position as general manager and director of the Magnet Consolidated Mines, Ltd. The company's property is in the Little Long Lac district of Ontario.

Douglas W. Vernon has been appointed general manager of sales for A. Leschen & Sons Rope Company, St. Louis, Mo.

The Republic Steel Corporation, through **E. I. Evans**, district manager, has announced the appointment of **Malcom E. Morgan** as superintendent of blast furnaces and coke works, for the southern district, which comprises both the Birmingham and Gadsden works. Mr. Morgan is a native of Alabama, and has been in charge of the Youngstown, Ohio, district, for Republic.

Luther B. Martin has been appointed director of tire development and research of United States Rubber Company with headquarters at Detroit, as announced by **Dr. Sidney M. Cadwell**, assistant general manager of the company's tire division.

Dr. Arthur W. Bull has been appointed associate director of tire development of United States Rubber Company also with headquarters at Detroit.

Frank Hamilton has been elected by the board of directors to serve as assistant to the president of Freeport Sulphur Company's subsidiary, Nicaro Nickel Company, **Langbourne M. Williams, Jr.**, president of both companies, announced recently.

Mr. Hamilton joined Freeport Sulphur Company in December, 1943, when the nickel plant in Cuba was just starting production to provide the United States a second source of supply for the vital armament metal. Prior to that he served in Washington on the staff of the Combined Production and Resources Board. He was previously associated with the firms of Monnet, Murnane & Company and Lee Higginson Corporation, New York.

P. R. Paulick, consulting mechanization engineer of Library, Pa., will spend the month of June in Nova Scotia surveying and analyzing conditions in several underground coal mines to determine mechanization possibilities.

At the annual meeting of directors of The Marion Steam Shovel Company **Maynard E. Montrose** was elected president and general manager. He succeeds **Carl F. LaMarche**, of Marion, Ohio, resigned.

Mr. Montrose was employed by General Electric from 1922 until 1935. In 1935 he became associated with the

Maynard E. Montrose

Lane-Wells Company, Los Angeles., and was executive vice president until his recent resignation.

The board of directors also elected **J. M. Strelitz**, Marion, Ohio, chairman of the board and general counsel; **Alec Gibson**, vice president and treasurer; **John P. Courtright**, vice president in charge of sales; **Harvey T. Gracely**, vice president; and **M. Virden**, secretary and assistant treasurer.

Lewis C. Tierney, president, and **George B. Baker**, general manager of the Premier Pocahontas Colliery Co. and the Tierney Mining Co., recently announced three appointments effective March 1: **Lawrence Runyon**, formerly superintendent of the Premier operations, has been promoted to general superintendent. **R. G. Farrell**, formerly chief engineer, has been made assistant general superintendent, and **J. W. Littleton**, store manager of No. 5 and No. 7 Eastern Coal Corporation stores, has been appointed general manager of stores for the Tierney Mining Company and Premier Pocahontas.

Tracy V. Buckwalter, for the past 25 years chief engineer and vice president of The Timken Roller Bearing Company, retired April 30, according to an announcement made recently by company officials. The company will, however, retain his services in a consulting capacity.

— *Obituaries* —

W. Gaston Caperton, 76, chairman of the board, Gaston Coal Co., Scotia Coal & Coke Co., and South Side Coal & Coke Co., died March 8 in Slab Fork, W. Va. He was a pioneer in developing the southern West Virginia coal fields and in 1900 organized with his brother the Wright Coal & Coke Co.

W. W. Bridges, 72, president, Black Diamond Coal Mining Co., Drakesboro, Ky., died March 10 in Washington. Mr. Bridges was also at one time president of the West Kentucky Coal Operators Association and had been in the coal business for 50 years.

Wallace L. Caldwell, president of The Alabama Asphaltic Limestone Company, died April 2 at Birmingham, Ala.

Charles F. Jackson, of Mamaroneck, N. Y., who as chief engineer of the mining division, United States Bureau of Mines from 1936 to 1942 organized and supervised the Government's exploration program for strategic metals, died suddenly May 3, in Toronto, Canada. He succumbed after suffering a stroke while in the office of Ventures, Ltd., with whom he had been associated as mining consultant.

Charles R. Alaniva, a well known former resident of the Mesabi range where he was superintendent for the Nelson Mining Company, died in Jacksonville, Tex., recently. He was in charge of the Mt. Haven iron mines at Jacksonville for the Sheffield Steel Company of Texas, a division of the American Rolling Mill Company.

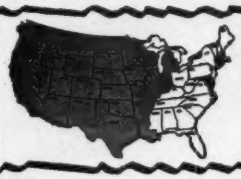
Frank B. Allen, president of the Allen-Sherman-Hoff Company, died April 8 at Philadelphia, Pa. Mr. Allen was recently awarded the Edward Longstreth medal of the Franklin Institute for his invention of the Seal Ring for use in centrifugal pumps handling abrasive solutions.

NEWS and VIEWS

Horse and mule haulage for certain applications is still preferred in many mines. Gathering cars at Bonne Terre mine, S. E. Missouri

Photo St. Joseph L

Eastern States



Coal Freight Rate Argued

The Commonwealth's argument for a rehearing of the decision by the Interstate Commerce Commission in which it refused to reduce the anthracite freight rate from breakers to tidewater took place recently in Washington, D. C.

The decision by the Commission was made by a majority of its participating members on October 11, 1943. The Commonwealth moved for a rehearing, asking that reductions in rates be required to the extent of 40 cents per gross ton, the figure found justified by the minority members and recommended by the Commission examiner. The rehearing is opposed by coal operators and the anthracite coal carrying railroads.

New Mine Cave Warning Device

At a meeting of the Northeastern Lehigh University Club, held in Wilkes-Barre, April 26, Dr. Cornelius Brennecke and Dr. Robert T. Gallager of the University, described a new device, the object of which is to give a warning of mine caves. The instrument shows movements of the earth's strata, and it involves the use of geophones and electronic-magnifying tubes which together show movements of the strata on a tape. Research, sponsored by the Anthracite Institute, is being conducted by the foregoing men at a local colliery and at Lehigh University.

Bill Affecting Anthracite Mines

A bill approved by the State Senate provides for the appointment of electrical inspectors by the Secretary of Mines. It will require the operators to file, with the proper mine inspector, the necessary maps concerning the use of electricity in the mines.

New Plant by Lehigh Coal and Navigation Co.

Robert V. White, president of the Lehigh Coal and Navigation Company, has announced plans for the construction of a $700,000 lightweight aggregate plant in the Panther Creek Valley where the company's anthracite mining operations are located. Ground will be broken as soon as detailed plans are completed.

The product, to be known as Lehigh aggregate, will be produced by utilizing the carbonaceous shale refuse material, which comes from the company's three breakers. It is estimated about 125,000 tons of finished product will be produced in a year.

Experimentation and research have been conducted by the company over a certain period, and a pilot plant has been making Lehigh aggregate for more than a year.

Silt Dam at Brookside

To prevent anthracite silt from entering streams, the Philadelphia and Reading Coal and Iron Company, Pottsville, has completed a silt settling dam at its Brookside colliery, near Tower City, Pa. The breast of this dam is built from clay and rock to a height of 25 ft. Additional height will be added as required.

Stockholders Vote Stock Split and Name Change

STOCKHOLDERS of the Westinghouse Electric and Manufacturing Company at their recent annual meeting voted to split the company's stock on the basis of four shares for one and also to change the company's name to *Westinghouse Electric Corporation*, for simplicity and brevity.

Purpose of the stock split, as explained by A. W. Robertson, chairman of the company, is to broaden the base of Westinghouse ownership by making the stock available at a lower price.

Authorized capital stock of the company today is 4,000,000 shares, con-

L. E. YOUNG
Consulting Engineer
Mine Mechanization
Mine Management
Oliver Building Pittsburgh, Pa.

sisting of 80,000 shares of preferred and 3,920 shares of common, of which 79,974 shares of preferred and 3,132,816 shares of common are outstanding, all with a par value of $50.

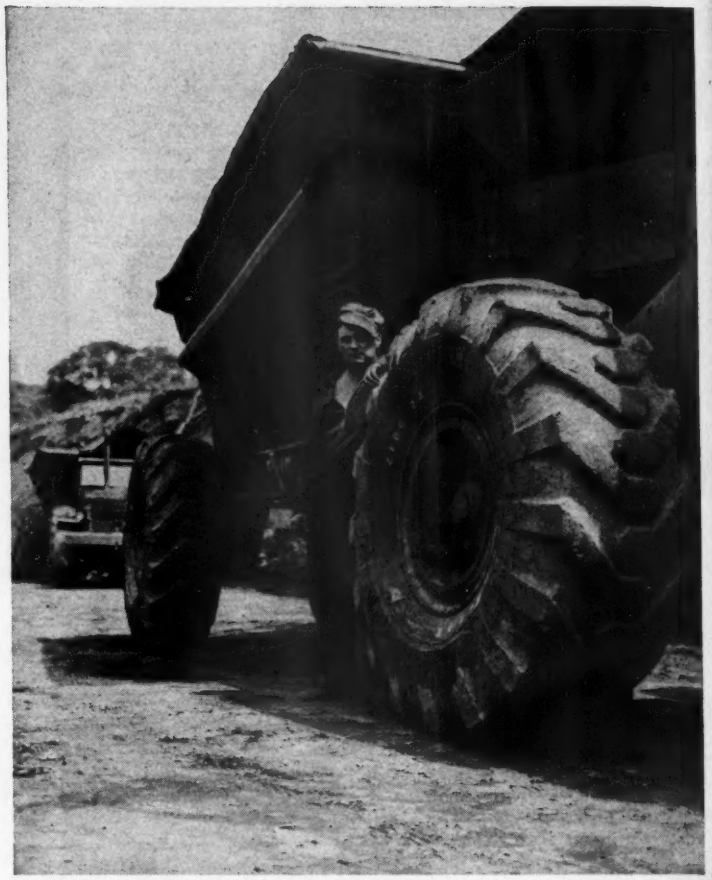
Total authorized shares of the new stock will be 16,000,000 of which—on the four-for-one basis—319,896 shares of preferred and 12,531,264 shares of common will be outstanding. Par value of the new stock, both preferred and common, will be $12.50.

Reclassification of the stock will not in any way change the preferences or relative rights of the stockholders and there will be no change in the terms of either the preferred or the common. The reclassification of the shares will not result in any change in the capital structure, surplus or other accounts of the company.

There are now about 48,000 Westinghouse stockholders, and none owns more than 1½ percent of the stock.

The stockholders also elected seven present directors to the 16-man board. Four were elected for 4-year terms. They are: George H. Bucher, president of Westinghouse; W. C. Robinson, president of the National Electric Products Corporation; Arthur W. Page, vice president of the American Telephone and Telegraph Company; and Robert T. Swaine, senior member of the law firm of Cravath, Swaine and Moore.

H. B. Higgins, president of the Pittsburgh Plate Glass Company, was elected for three years. Named for 1-year terms were Gwilym A. Price, Westinghouse Vice President, and John R. Read, chairman of the board and president of the Canadian Westinghouse Company.



Goodyear Photo

Truck driver pauses briefly while waiting his turn to load at a coal strip operation near McDonald, Pa.

Tungsten Mining Corporation Formed

Haile Mines, Inc., and General Electric Co. have merged their tungsten mining operations in the Tungsten Mining Corporation, in which General Electric Co. holds a substantial interest.

This new company will own the tungsten property recently developed by Haile Mines in Vance County, N. C., together with the large tungsten properties acquired and developed by General Electric Company in Idaho and Arizona during the past five years, which properties have never been placed in operation. The Idaho property, known as the "Miller Property," adjoins the Ima Mine, which has been the largest producer of hubnerite in this country.

General Electric Co. has contracted for the entire output of these properties over a period of years and provision has been made for the immediate construction of a new concentrating plant and large scale underground development at the North Carolina property.

Haile Mines, Inc., will furnish all operating and executive personnel to Tungsten Mining Corp., and also plans to return to gold mining as soon as possible after the revocation of WPB Order L-208 which closed the principal gold mines in the country in 1942.

Veterans Awards

Recently, the veteran employes of the Tennessee, Coal, Iron & R.R. Co., who have given, in the aggregate, more than 4,000 years of service to the company, were awarded service certificates. Usually medals are given, but to conserve metal, the men were given certificates, which will be exchanged for medals later.

Minot E. Towers was awarded a certificate for 45 years of service. He is in the ore mines and quarry division. There were seven 40-year certificates, eighteen 35-year, twenty-eight 30-year and one hundred and ten 25-year certificates.

PETER F. LOFTUS
Consulting Engineers
ENGINEERING AND ECONOMIC SURVEYS, ANALYSES AND REPORTS ON POWER APPLICATIONS AND POWER COST PROBLEMS OF THE COAL MINING INDUSTRY
Oliver Building Pittsburgh, Pa.

P. R. PAULICK
Consulting Mechanization Engineer
Specializing Exclusively in Practical Engineering Application of Fundamental Mine Mechanization Principles; Selection of Proper Equipment; Correct Engineering Planning; Proper Installation; and Efficient Operation.
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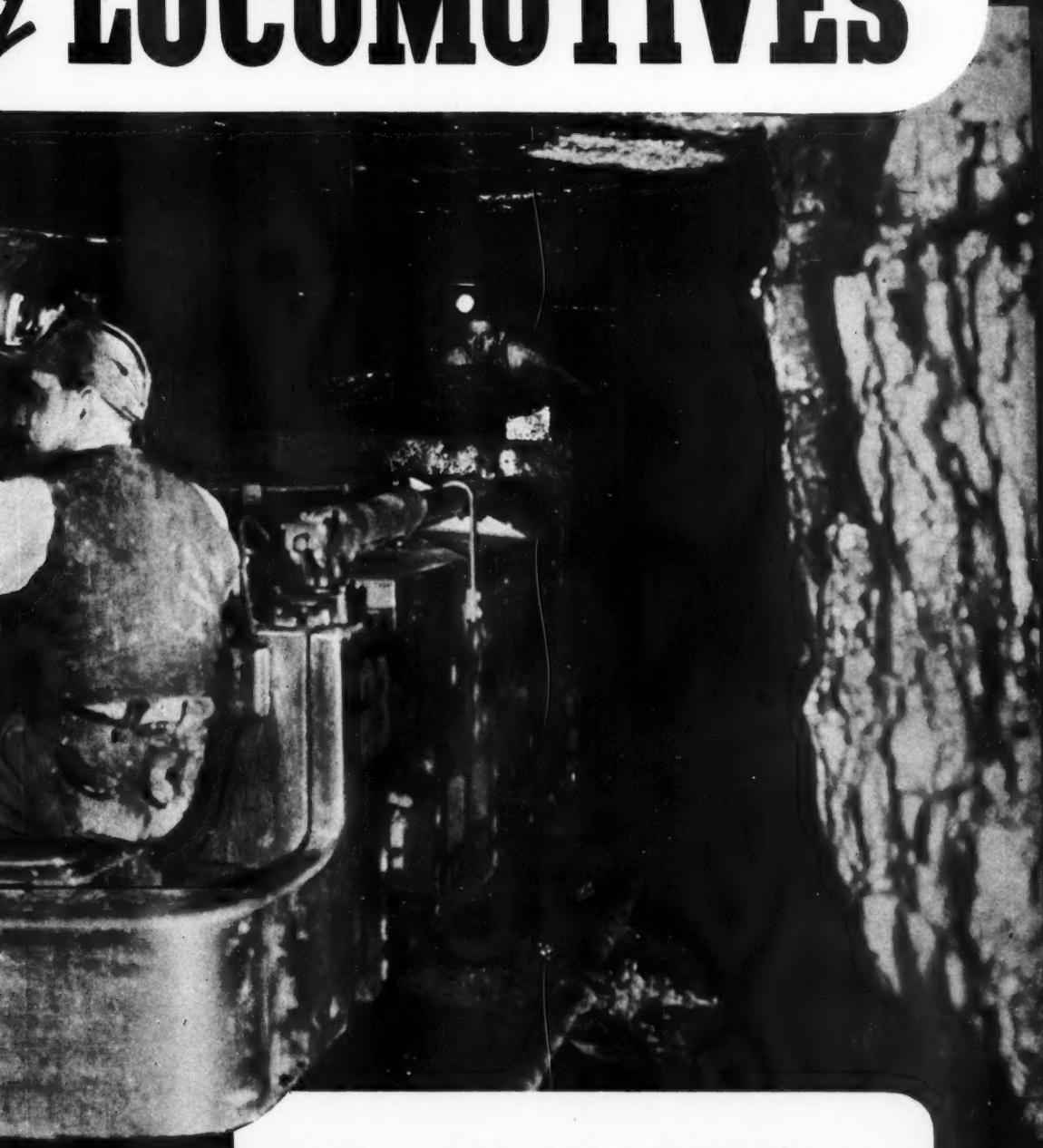
IT REQUIRES APPROXIMATELY 105 MILLION TONS OF COAL ANNUALLY

to heat the Homes and Commercial Buildings of the United States

JEFFREY has a definite interest in this tonnage because of the vast number of Drills, Cutters, Loaders, Locomotives, Mine Conveyors and allied equipment as well as Replacement Parts used to produce this coal. Jeffrey builds a complete line of coal mining machinery—for below and above ground operation—has an engineering staff to help you select the right unit for your particular condition and need.

JEFFREY *Gathering* I

LOCOMOTIVES



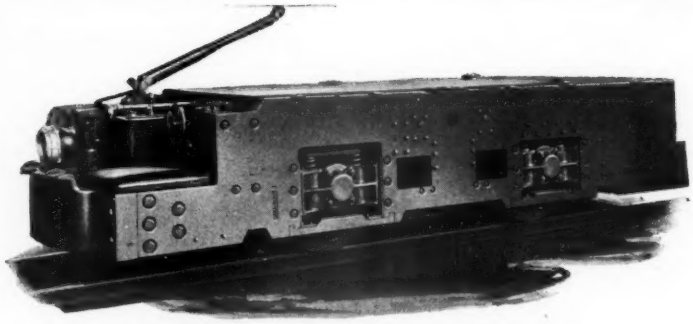
Here is a typical installation of a Jeffrey Gathering Locomotive equipped with cable reel. This type is built in sizes up to 8 tons—with inside or outside wheels. Jeffrey also builds a wide variety of sizes in storage battery types for gathering and haulage. There is a Jeffrey Locomotive (see back page of this insert) for all gathering and haulage needs around the mine.

Jeffrey LOCOMOTIVES

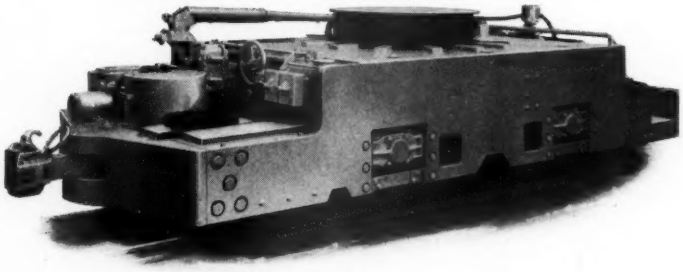
JEFFREY SERVICE TO THE COAL MINES MEANS SERVICE TO ALL INDUSTRY

JEFFREY EQUIPMENT FOR COAL MINES

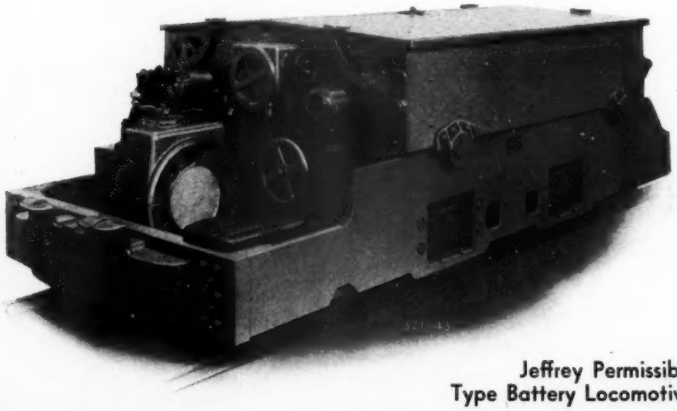
- BLOWERS
- CONVEYORS
- CRUSHERS
- CUTTERS
- DRILLS
- FANS
- JIGS
- LOADERS
- LOCOMOTIVES
- SCREENS



Jeffrey Trolley Type Haulage Locomotive



Jeffrey 8-ton Explosion Tested Gathering Locomotive



Jeffrey Permissible Type Battery Locomotive

THE JEFFREY MANUFACTURING COMPANY

Established in 1877

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Sales Offices:	Baltimore Birmingham Boston Buffalo	Chicago Cleveland Cincinnati Detroit	Denver Harlan Houston Huntington	Milwaukee New York Philadelphia Pittsburgh	Scranton St. Louis Salt Lake City
Service Stations:	Pittsburgh Harlan, Ky.	Birmingham St. Louis	Logan-Beckley W. Va.	Scranton	
Foreign Plants:	Jeffrey Mfg. Co., Ltd. Montreal, Quebec	British Jeffrey-Diamond, Ltd. Wakefield, England	Jeffrey-Galion (Pty), Ltd. Johannesburg, S. A.		

Zinc Institute Elects New Officers

AT THE Twenty-seventh Annual Meeting of the Board of Directors of American Zinc Institute, Inc., held in New York on April 17, O. W. Bilharz, president of Tri-State Zinc & Lead Ore Producers Association, was elected a vice president to succeed J. A. Robinson, resigned, and all other officers were reelected for the ensuing year as follows: H. I. Young, president; C. M. Chapin, Jr., R. B. Caples, O. W. Bilharz, vice presidents; R. F. Orr, treasurer; E. V. Gent, secretary.

Directors elected to fill vacancies on the board include: O. W. Bilharz, president, Tri-State Zinc & Lead Ore Producers Assn.; J. M. Bowlby, president, Eagle-Picher Co.; E. V. Daveler, vice president, American Zinc, Lead & Smelting Co.; Henry Hardenbergh, president, New Jersey Zinc Co.; H. E. Son, president, Hegeler Zinc Co.

The following directors whose term of office expired were reelected: R. B. Caples, Anaconda Copper Mining Co.; S. A. Easton, Bunker Hill & Sullivan Mining & Concentrating Co.; Clarence Glass, Anaconda Sales Co.; G. W. Potter, Joplin, Mo.; A. L. Queneau, U. S. Steel Corp.; F. A. Wardlaw, Jr., International Smelting & Refining Co.; H. I. Young, American Zinc, Lead & Smelting Co.

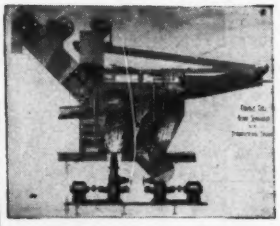
Black Bullets

THE War Department is currently releasing a special coal motion picture entitled "Black Bullets." This film is 19 minutes in length and draws upon some tell-tale enemy film footage to get its message across.

The film opens with a scene showing a Nazi train carrying coal to German slave-run war plants. German mines are worked by the toiling backs of imprisoned Frenchmen, Poles, Russians and Czechs. The camera then switches to the Far East where captured Japanese film show how the "Sons of Nippon" operate their mines. These two scenes tell only too clearly what type of "competition" faces our American mines. It was slave against free man but the American miner is shown matching the enemy lump for lump and ton for ton.

Sixteen mm. film distributors have been set up in coal mining areas throughout the country, and plans include 35 mm. theatrical showings in important mining towns. The Motion Picture Branch, Industrial Services Division, Bureau of Public Relations, Room 10683, Pentagon, Washington 25, D. C., is the source for information on distribution and availability of this film.

PRODUCE *Better Coal* AT LOWER COST . . . WITH R and S MODERN EQUIPMENT

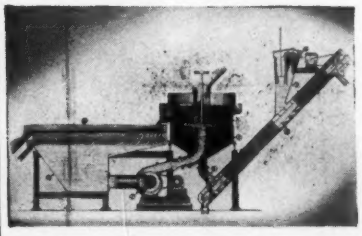


For all coarse coal washing

✔ HYDRO-SEPARATOR

IMPROVED LAUNDER TYPE

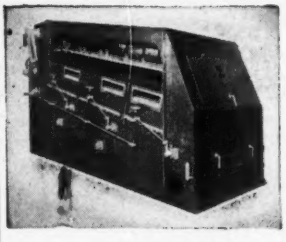
A product of painstaking engineering and long, intimate knowledge of production problems, the Hydro-Separator is known wherever coal is mined, as an exceptionally well built, efficient unit.



For low cost washing of fine coal . . .

✔ The HYDROTATOR

This is the effective way to wash fine coal and get increased recovery of marketable coal from sludge and refuse. Low cost efficiency is built into the Hydrotator.



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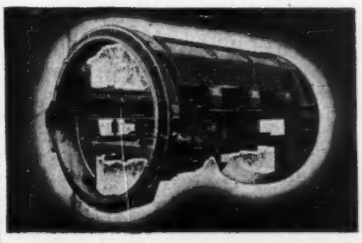
Experienced operators *know* Stump Air-Flow—know it for its simplicity and dependability, for its sturdy construction. It cleans, dries, dedusts in one operation.



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Steel in Pre-Fabricated Post-War Homes

EXPERIENCE and knowledge gained from wartime design are focusing attention upon the use of steel in the prefabrication of postwar homes, according to Milton Male, Research Engineer, United States Steel Corporation. With growing appreciation of the advantages inherent in steel, as well as a better understanding of some of its construction limitations, the building industry will doubtless find many new uses for steel when the war ends.

Steel has long been utilized in housing for such purposes as lathing, trim, roofing, windows and for plumbing, kitchen and bathroom equipment and new uses include structural framing and covering, for which the steel is cold formed to the desired shape from the originally flat, light gauge sheet or strip less than ⅛-in. thick. Special emphasis is being laid upon steel for the single-family, shop-prefabricated home.

"Compared with other common building materials, steel has high strength. In light gauge steel for structural purposes, the minimum tensile strength is 55,000 pounds per square inch, and the yield strength (the more important criterion for design) 33,000 pounds per square inch. This great strength offers wide opportunities to designers and architects, especially for house framing. It must be remembered that residential loads are relatively light and that to take advantage of steel strength, structural members frequently may be made thinner than practicable for other purposes."

The durability of light gauge steel members has been the subject of exhaustive investigations, the most recent findings having been issued in 1942 by the American Iron and Steel Institute under the title, "The Durability of Light Weight Types of Steel Construction." All the available information indicates that when steel is kept dry it does not corrode and since light gauge framing members are normally enclosed within the walls or floors of a house, not exposed directly to the elements, the paint coating applied during fabrication or erection provides adequate protection for the life of the house.

One of the most important problems in the use of any material for framing a house is the possibility of dimensional changes. Shrinking and warping are annoying enough during fabrication but changes after the house is occupied, such as cracking of fine finishes, misfit of doors and windows, opening of wall joints, etc., all entail added maintenance cost. While plywood and seasoned lumber undoubtedly minimize these evils the use of steel framing is said to eliminate them entirely and to give positive assurance of stability and low maintenance cost throughout a home's life.

Going on to details of fabrication, Mr. Male asserts that while war applications have made the public aware of the strength and toughness of steel, it should also be remembered that steel is highly ductile, that it can be readily formed and bent into many desired shapes. He cites as examples automobile bodies and fenders, refrigerators, stoves, as well as toasters and the many familiar appliances of everyday living. This easy formability of steel is especially advantageous for house construction, since shop fabrication requires only the simplest of equipment.

Steel not only offers the prefabricator of homes the advantages of strength, durability, dimensional stability and easy and economical fabrication, but also incombustibility and "the consequent reduction of fire hazards, always an important factor in public acceptance."

Bituminous coal miners recently re-enacted the Iwo Jima flag-raising incident on a mountain of coal at Charleston, W. Va., during Seventh War Bond Drive ceremonies. Miners and operators have bought heavily of War Bonds in all drives to date

More Synthetic Latex

Production of special synthetic rubber latex now exceeds one and one-half million pounds per month at one of the Government's latex producing plants, operated for Rubber Reserve Company by United States Rubber Company at Naugatuck, Conn., according to J. P. Coe, general manager of that company's synthetic rubber division.

This liquid form of synthetic rubber replaces natural rubber latex where it was used in the manufacture of most synthetic rubber tires, and in fabric and paper impregnation. Nearly ten million pounds were produced last year, at the Naugatuck plant and production by the end of this year is expected to reach two million pounds per month.

Central States

Stripping Crown Point Land

Stripping of the old Crown Point land, a 54-acre tract situated just east of Duenweg and south of U. S. highway 166, formerly Missouri state highway 14, has been inaugurated by the Magajupa Mining Company.

Walter Martin of St. Louis is in charge of the operations, which are being carried on with a Link-Belt ⅝-yd. power shovel and a P. & H. ¾-yd. dragline unit. Lead ore is to be recovered from shallow deposits.

The Crown Point tract was mined several years ago for its shallow lead deposits and prior to that a number of years ago was mined by Birch & Carmean at a depth of 158 ft.

Ore from the present operations is to be trucked to the Webb City Custom Mining Company, east of Webb City, for treatment.

Make Strike on B. & R.

The Eagle-Picher Company is reopening the No. 2 shaft on the B. & R. lease of the Lottson allotment, a mile southwest of Cardin, where churn drilling has disclosed a lower run of rich ore, according to S. S. Clarke of Baxter Springs, general mine superintendent.

A steel derrick and 500-ton hopper has been moved from the old Crystal mine, a short distance to the northeast, to the new development. The B. & R. shaft has been deepened 15 to 20 ft. to the lower run of ore from the 280 to 285-ft. level.

Ore will be shipped by rail to the company's Central mill for treatment.

Mica Operations Stopped in Custer Area

Colonial Mica Corporation has discontinued the operation of its custom rifting shop at Custer, S. Dak. No mica has been accepted for rifting since December 31, 1944. The operation since that time has been devoted entirely to preparing mica on hand as of that date.

It is planned to maintain the Custer office at least until July 1 to take care of buying, instruction in grading and qualifying, and rental of equipment to approved operations, according to Stuart Ferguson, manager.

"One of the chief functions of Colonial rifting shops has been the training of personnel in the proper preparation of mica. It is the belief of the local Colonial staff that this function has been well carried out and that the Custer area is fortunate in having a large group of its citizens who are well qualified to properly prepare mica," Mr. Ferguson stated.

New Phelps Dodge Plant at Fort Wayne

Expansion of its permanent production facilities by construction at Fort Wayne, Ind., of a $4,500,000 wire and cable plant has been announced by the Phelps Dodge Copper Products Corporation. The new plant will be fully equipped for copper rod rolling and for wire drawing, stranding and insulating on a tonnage basis.

About 31 acres have been acquired for the project, according to Wylie Brown, president of the corporation, and operations preliminary to actual construction are already well under way. "The engineering work is practically finished," Mr. Brown stated, "and building will begin just as soon as government restrictions allow. When completed, the plant, we believe, will be the most modern in the country and will employ about 4,000 persons at full production."

Mr. Brown emphasized that the new mill, which is being built without government assistance, is not primarily for increased production of war materials, but will be a permanent addition to the nation-wide manufacturing facilities of the company. The corporation now has fabricating mills at Yonkers and Nepperhan, N. Y., known as its Habirshaw Cable and Wire Division; rod, wire, strip and tube mills of the Bayway Division at Bayway, N. J.; the Los Angeles Tube Division at Los Angeles, Calif., and the magnet wire and coil mills of the Inca Division at Fort Wayne, Ind. The new plant will not be an addition to the present Fort Wayne Inca Division, Mr. Brown said, but will be operated as a separate division.

"This expansion," Mr. Brown explained, "was decided upon because of the certainty of increased postwar demand for the products we manufacture and to enable us better to serve the industries and utilities of the great mid-Western area.

"The output of this new wire and cable division will be readily available to a large part of the automobile, radio, electrical appliance, aviation and other industries that have extensive requirements for these products, and the convenient location of this plant will be of material benefit, from a servicing standpoint, to these users."

The site of the new mill fronts on the Lincoln Highway across from the present Phelps Dodge Copper Products Corporation Inca Division plant. Its rear extends about 1,800 ft. along the Wabash Railroad west of Meyer Road.

FOR SALE

50-Ton Texas Mill

This is the most modern and completely equipped, electrically-operated, fifty-ton mill in the Southwest for treating copper, lead and zinc, fluorspar, and tungsten ores.

Transformer Station
2 Jaw Crushers
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Strip License Bill Introduced in Illinois

A bill to license and tax strip mines in order to provide funds with which to restore the surface was introduced in the Illinois Assembly recently by Rep. Paul Powell and was referred on March 7 to the House Judiciary Committee. Appropriations called for by the measure amount to $500,000.

The measure levies a tax of 4 cents per ton on strip-mined coal produced after September 1, 1945. Persons engaged in strip mining would be required to obtain a certificate from the Department of Mines and Minerals and to file a surety bond with the department conditioned upon compliance with the Act. Each operator would also be required to file annually a statement showing the tonnage mined by him during the preceding year.

The bill sets forth grounds upon which the department may suspend or revoke certificates issued by it and provide for judicial review of decisions of the department. The strip-mining fund in the state treasury would receive the money so derived and the fund would be used to restore the topography of the land where strip-mining operations have been carried on.

April 1945 Ore Shipments High

Shipments of Lake Superior iron ore have already made a fine beginning for the current shipping season; 7,282,074 gross tons were shipped during the month of April as compared to 8,649,708 gross tons in April 1942, the highest April shipment for all time. In April 1944, only a little over 5,000,000 tons were shipped. Pack ice and fog are reported to have caused less than the usual delays during this the second largest shipping month in Lake Superior iron ore history.

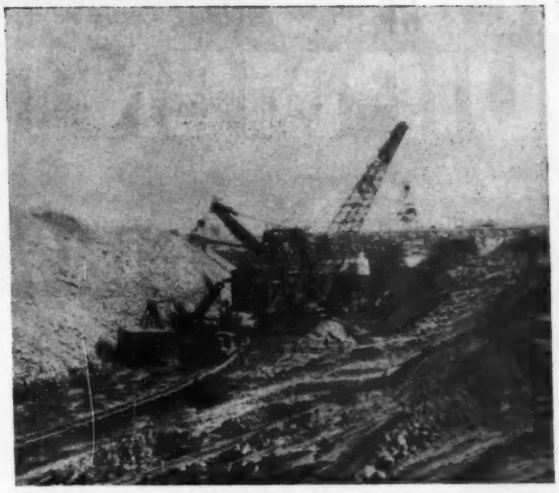
Calumet & Hecla Activities

Primary copper production of Calumet & Hecla Consolidated Copper Company from the Calumet division during 1945 will be considerably less than in 1944, according to the report to stockholders recently made by George S. Mumford, chairman, and Endicott R. Lovell, president.

"This is accounted for by the gradual reduction in the grade of ore in the mines with increasing depth and the exhaustion of the Lake Linden and Tamarack deposits of conglomerate tailings," the report said. It was added that the Lake Linden reclamation plant has contributed the major portion of the company's earnings for many years.

"Although earnings of the Wolverine Tube division in 1944 were satisfactory and may be even higher in 1943, reduced output and higher supply and labor costs at the Calumet division will probably result in lower overall earnings during the current year."

The report also said that the increasing wage burden cannot be supported by high-cost producers in peace time unless the price of copper is allowed to rise considerably above prewar levels.



Strip mining at Wilmington No. 10 mine in northern Illinois. Stripper is finishing cut. Dragline is topping next cut. Coal is being loaded into pit railroad cars

Dr. Yellott to Direct Locomotive Research

DR. JOHN I. YELLOTT, who was named "The Outstanding Mechanical Engineer" of the past decade by Pi Tau Sigma, has been selected to direct immediately, the new $1,000,000 program of the Locomotive Development Committee of Bituminous Coal Research, Inc., for increasing the efficiency of American railway locomotives through the use of powdered coal, development of turbines and the application of newer steam power principles, it was announced recently by the chairman of the committee, Roy B. White, president of the Baltimore and Ohio Railroad Company.

This newly organized research program is sponsored by six railroads

20-ton dump truck in operation at Snyder Mining Co.'s Webb mine near Hibbing, Minn.

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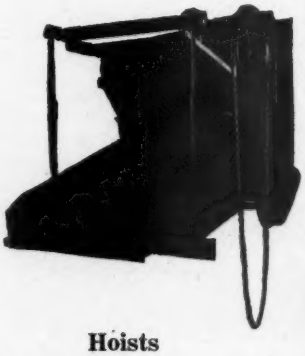
MODERN MINING

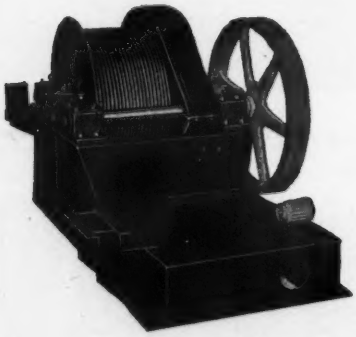
Overturning Cage

Dumps through 130° arc; permits use with solid end cars, and assures cleaning of cars. Has added advantage of elimination of maintenance on car doors.

Holmes Dust-O-Lator

This is a self-contained unit, combining a withdrawal gate, mechanical screen, and automatically controlled power unit for use in removing objectionable dust and fines from the coal as it flows to the truck.



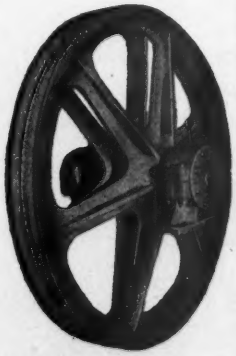


Hoists

Custom built to suit local conditions; available for steam or electric power from fifty horsepower up.

Cast Spoke Sheave Wheels

These cast, all-steel spoke sheave wheels may be had in a wide range of sizes, for either single or double strand operation. Full machine turned in the groove for long rope life.



ROBERT HOLMES AND BROS.

BINS - GATES - LOWERING SPIRALS - DUST-O-LATORS - SHAKING GATES

DANVILLE, ILLINOIS

and three coal companies that include the Baltimore and Ohio Railroad Company, Chesapeake and Ohio Railway, Louisville and Nashville Railway, New York Central Railroad, Norfolk and Western Railway, Pennsylvania Railroad Company, M. A. Hanna Company, Island Creek Coal Company and the Sinclair Coal Company.

Dr. Yellott is now the director of the Institute of Gas Technology of the Illinois Institute of Technology and is the inventor of a new method of pulverizing coal through the direct action of moderate steam power. He is a member of the American Society of Mechanical Engineers and also of the executive committee of its power division.

In 1942, Dr. Yellott was named the Outstanding Young Man of Illinois and also received the Illinois Civic Service Award from the Illinois Junior Chamber of Commerce. During the war he has served as chairman of his institute's war training committee which has trained over 50,000 men and women for essential technical positions.

Dr. Yellott is a graduate and postgraduate of Johns Hopkins University.

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FOR FAST, CHEAP HANDLING OF ORE, COAL, EARTH, ETC.
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Western States

Great Western Starting Work at Blue Bird

The Blue Bird mine at Nederland is to reopen soon under the management of Walter A. Moore, president of the Great Western Gold & Silver Mines Corporation, and C. W. Savery, president of the U. S. Mining & Milling Company which has an interest in the Great Western.

The large mill at the Blue Bird property failed to recover the silver from the rich bromide ores which made the mine famous in the early days for its high-grade ore. It is known that once in the early days a smelter was built to roast the silver from the ore but this failed as the bromides vaporized and apparently carried off the values.

The old Great Western Silver Mines Corporation has been reorganized and has merged with the Silver Syndicate, also a C. W. Savery corporation, and is now known as the Great Western Gold & Silver Mines Corporation.

Mr. Moore has done considerable testing of the ore and says he has discovered a method of milling bromide ores. His tests ran an assay recovery of concentrates said to be $6,750.25 per ton. With this method in mind, the company is going to put in the necessary equipment to make a mill test and if it proves successful, the entire mill setup will be equipped to handle both bromide ore and sulphide ore, as this requires a separation. A selective flotation system will be used.

Silver King Coalition in 1944

Net profit of the Silver King Coalition Mines Company amounted to $6,870.32, after depreciation in 1944, according to James Ivers, vice president and general manager in his annual report to stockholders.

During the year 54,252 tons of ore were milled and 294 tons of crude ore shipped direct to the smelter. Treatment of the mill heads resulted in 5,189 tons of lead concentrates and 2,729 tons of zinc concentrates. Combined ore sales grossed $1,254,877.07.

Operations were adversely affected by a shortage of manpower, which necessitated an unbalanced operation and forced the company onto a one-shift operating basis, it was pointed out by M. G. Heitzman, manager of operations.

Regarding the development of a new ore body, Mr. Heitzman states, in part:

"On the 28th day of September, development work on the 1,960 level struck a large flow of water which came with such a surge that the pumps on the 1,900 level were drowned out and the workings of the west end and 5,141 sections of the mine were flooded. A submersible pump and a sinking pump were installed and the water was lowered to the 1,900 level by December 29. Additional pump stations have been cut on the 1,700 and 1,900 levels and new station pumps and additional pipe lines are being installed. This work will have progressed sufficiently to permit resumption of mining operations on the 1,800 and 1,900 levels about the middle of March and on the 1,960 level a few weeks later.

"Development work on the 1,960 level opened up the continuation of one of the west end ore bodies. The limited amount of development work done after encountering the ore and before the inundation inhibits any reliable estimate of the extent of this ore body. The ore where opened is high grade silver-lead ore, carrying low zinc."

New State Officials

Effective May 1, Capt. R. R. Spurrier, Hobbs, Lea County oil operator, became state geologist and secretary of the New Mexico Oil Conservation Commission by appointment of Gov. John J. Dempsey. He succeeds John M. Kelly, who resigned the position last February to become associated with a West Texas independent oil operators association. The new geologist is a graduate of the New Mexico School of Mines and will be relieved from inactive Army duty to take over his new position. Warren C. Bracewell, New Mexico State Mine Inspector, will have two new deputy mine inspectors authorized by the state legislature. The mine inspector likewise was given an increase in salary to $3,600 a year and the deputy inspectors will draw $3,000. each for their services. The increase in inspectors will make possible more frequent inspection of metal and coal mines and the carrying on of a more intensive safety program.

Smuggler Group Patent Sought

The United States Smelting Refining and Mining Company, operating properties at Bayard, Grant County, L. H. Duriez, general manager, has

The CORRECT rope for your mining equipment

MACWHYTE
PREformed

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WHAT IS COORDINATED CONVEYOR ENGINEERING?

Simply this: three separate engineering staffs working as a team to provide a system of low cost haulage of coal, ore, sand, gravel and other bulk materials. These three are engineers representing: mine or plant operators, conveyor equipment manufacturers and United States Rubber Company.

Such three-way teamwork results in a belt conveyor which carries materials efficiently, handles

output at minimum cost. Thousands of U. S. Rubber Conveyor Belts, designed and installed through coordinated engineering, are contributing to low cost conveying.

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made application for United States patent for the Smuggler Group of lode mining claims, in the Mimbres Mining District. This company, since outbreak of the war, has become one of the largest producers of zinc and lead in the Silver City mining area, and is constantly expanding its development and mining operations.

Belmont McNeill to Start

The Belmont McNeill mine southwest of Wickenburg in the Vulture district, will soon be back in production, according to recent reports. Ralph H. Pfeffer has installed new machinery, cleaned out old workings and is ready to start shipping lead and copper.

Tonopah interests first developed the Belmont McNeill and at one time, they thought, had a sensational gold strike. Between 1926 and 1930 it is reported to have yielded $210,000 worth of gold, $120,000 worth of silver, 700 pounds of copper and 6,000,000 pounds of lead.

Little Butte Has High Grade Ore

High grade gold ore is reportedly being produced in accordance with Government limitations on gold mining, at Little Butte mine by Phoenix Equipment Company at Phoenix. A large vein of good copper ore is reported present in the little Butte in addition to the gold vein. Former lessees on the property are reported to have produced over $35,000 in the past two years.

Getchell Mine Closes

The Getchell Mine, largest gold producing mine in Nevada, is closing for the duration. Announcement of the closing was made by George Wingfield, president, who explained it was due to shortage of labor and difficulty in obtaining supplies. The mine, including a 3,000-ton cyanide mill, will close as soon as a clean-up of the plant is completed and gold now in solution in the series of huge tanks is removed.

Getchell Mine, Inc., has been the largest producer of gold in this state for the past seven years. It is located in Humboldt County and had its beginning in 1934 with the sampling of a massive outcrop of ore by Noble H. Getchell, then operating at Gold Circle, in Elko County. Getchell enlisted the interest of Wingfield and several associates, and the property became one of the largest in the state. The company first had a 600-ton cyanide mill and a huge roasting plant, as the highest grade of ores found had to be first roasted. This class of ore now appears to be exhausted, but there is yet an immense body of milling ore, but of lower grade than the oxide. The mill was later enlarged, and in 1942 equipment was installed for treating 400 tons of tungsten ores daily.

From the roasting unit hundreds of tons of arsenic were saved for war purposes, and for this reason the company was able to continue in operation despite WPB restrictions on gold mining. It was the labor shortage that caused closing more than anything else. Wingfield's statement on the closing is as follows:

"Since the promulgation of the Government's gold mine closing regulation Order L-208 in 1942, the operation of the Getchell Mine, even in furnishing the strategic metals, arsenic and tungsten, for the Government, has been carried on with increasing difficulties due to a shortage of labor and scarcity of repair parts and supplies, until those conditions have be-

Tamping Bags Give Better Results In Many Ways . . .

Comparative tests by many mining companies have proved that by using bags—SEALTITE BAGS—a better tamp can be made easier and quicker than by using the old "bug dust—catch as catch can" method.

With a better tamp they get more safety—less fumes and smoke and less blown-out shots. The amount of explosive can be reduced and still bring down more coal per shot.

It's important to have uniformly sized bags—as near the bore hole size as possible as it gives a tighter tamp and prevents shots from blowing out. All SEALTITE bags are exact in size.

Have your company make a test. We will furnish the samples FREE. Write for them today.

come so grave that it is impossible to continue operations.

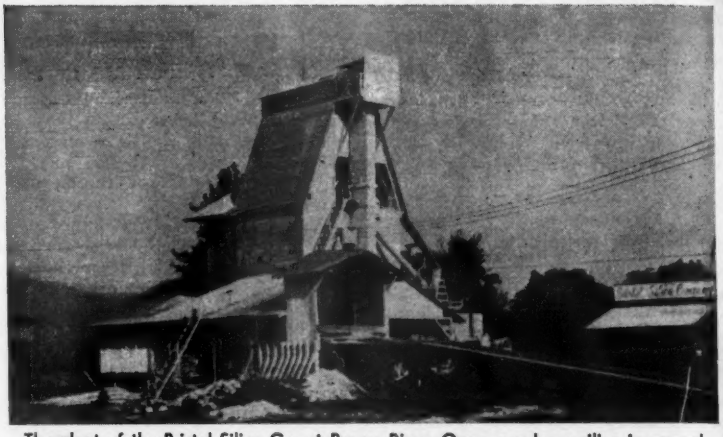
"As a consequence, this condition has caused the directors of the company to suspend all operations. However, should the Government require arsenic or tungsten again at any time these metals will be produced by the company."

In the few years the company has been operating it has been able to pay dividends in excess of $2,000,000. There is ore blocked out that will enable it to operate for years.

Nevada Prospecting Continues

Despite the fact that gold and silver mining in Nevada has been at a standstill for three years, there has been prospecting going on on a small scale and mining men believe that as soon as the ban on mining is lifted, Nevada may see some activity that will result in opening of some good properties, with perhaps even new camps.

Efforts are said to be under way to revive mining in the Olinghouse district east and north of Reno, where rich pockets of gold ore were once taken frequently. At one time in early days there were several mills operating in this district.



The plant of the Bristol Silica Co. at Rogue River, Oreg., produces silica in several standard and some special sizes for a variety of uses

Search for war minerals has been so intense in the past year or two that prospectors have not been too much occupied with locating gold and silver claims, but there are current reports that some good gold properties will be opened up as soon as mining restrictions are lifted.

There are still old timers around the once famous Nevada camps who believe there will be new finds of rich ore in those areas, and they will not give up until it is found, or circumstances prevent further search. The Comstock area has a few of these old time miners left, and many still hang on at Tonopah and Goldfield. At the two latter camps they have done well with leases, making much better than day's wages. There is a demand for

PARMANCO Horizontal Drills

PARMANCO Horizontal Drills are used exclusively in the Iron Range for horizontal drilling.

They are also used by a large percentage of the strip coal mines.

The new PARMANCO Vertical Drill has revolutionized test drilling.

Write us your drilling problems.

PARIS MANUFACTURING CO.

PARIS, ILLINOIS

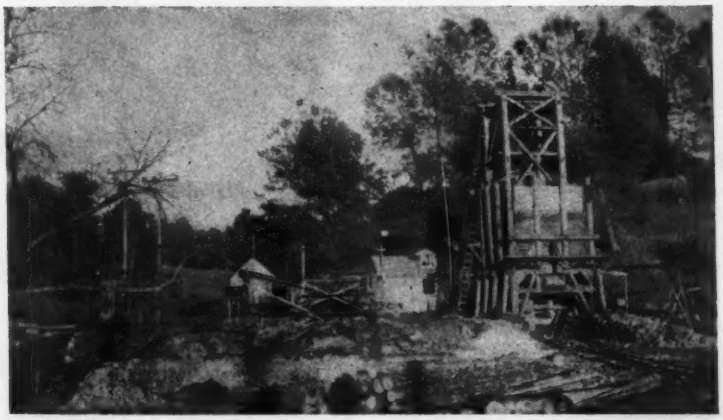
patented mining claims, the title to which have gone to the various counties for tax delinquency, and some of these claims may be the scene of activity as soon as there can be any activity.

Seven cars of ore were shipped out of Tonopah during February, all of it coming from leasers and being of a grade to warrant shipping rather than local milling—there are no mills working now.

Union Copper at Copperopolis

Calaveras Copper Venture of Pacific Mining Company, April, '44, showing (at right) 1,500-ton flotation plant located at old Union Copper property near Copperopolis, Calaveras County, California. Hydraulicked tailings from old operation are pumped through pipeline at lower right. Recovery has been approximately 3 lb. per cubic ton of tailings. Concentrate is trucked to Farmington, then shipped by rail to A. S. & R. at Garfield, Utah. Hugh W. Coke is manager at the Calaveras plant.

The Newton Mine



Newton mine of Winston Copper Company, March, '45, operated by Pacific Mining Company, Amador County, California, is located at site of the old mining town of Ranlett, on the highway between Jackson and Ione. Picture shows shaft headframe and divided bin at right, with compressor house immediately behind, and office further to left rear. At extreme right is flume leading from pump discharge to scrap plating boxes. Shipments are twenty to fifty tons per day of 5 to 7 percent copper ore, by rail (as cars are filled) from Ranlett to American Smelting and Refining at Garfield, Utah. Harold Hansen is superintendent.

Monitor Gets Ready

The Monitor Mining Company reports that it is getting ready for extensive mining operations in 1945, providing the premium price on lead and zinc holds good throughout the year. For last year's operations, which included a lot of improvements, the company reports a net loss of $98,372.73. The Monitor Company is developing an extensive zinc-lead district north of Wallace and has brought several mines in this area to the producing stage. The company has one milling plant of its own at the Carlisle mine and is shipping ore from other mines to the Dayrock and Hercules mills in Wallace.

Sidney to Build Mill

Sidney Mining Company will build a 250-ton capacity modern flotation mill on Red Cloud Gulch in the Pine Creek district west of Kellogg at an estimated cost of $200,000, as soon as labor and materials are available, according to W. T. Simons, secretary. Plans for the mill have been drawn by C. Y. Garber, mill superintendent for the Bunker Hill, and sufficient high grade lead-zinc ore has been developed in the mine to operate such a plant at capacity for a number of years without further development. The company is treating 50 tons per day at a small experimental plant of its own and 50 tons per day at the Amy-Matchless mill further down Pine Creek.

Surprise Shaft at 700 Level

The Highland-Surprise Mining Company, adjoining the Sidney mine on the east, has completed its Surprise shaft to the 700-ft. level and driven a crosscut to the vein, which proved to be 16 ft. wide and averaging 9 percent in combined zinc and lead. Drifting westerly on the hangingwall of the vein has since developed a streak of lead ore 4 ft. wide which assays about 30 to 40 percent lead. The main crosscut also developed another vein further south which gave good returns in both silver and lead, but some experimental work proved the crosscut through the apex of this vein.

Close-up of the lapel button, designed to be worn by discharged veterans of World War II

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and where
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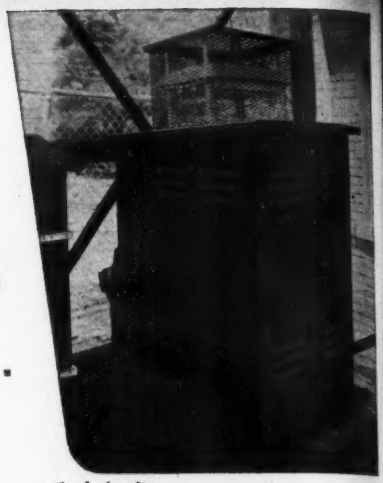

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By interrupting overload currents which can anneal trolley wires without opening a substation circuit breaker set to trip at a high current value, I-T-E Sectionalizing Circuit Breakers strike at major causes of mine fires.
Investigate this protection which can pay returns in in excess of the original cost.
Write for I-T-E Bulletin 2502. I-T-E Circuit Breaker Co., 19th & Hamilton Sts., Philadelphia 30, Pa.

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with 15"x 24"
Hopper Opening

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GRUENDLER
CRUSHER and PULVERIZER CO., ST. LOUIS 6, MO.

Wheels

(*Continued from page* 54)

pose described in Title I hereof" (restoration of soil resources). Section 103 (a) (3), Title I is seen as fostering government competition with private industry. It directs the Federal Government to engage in a national fertilizer program and to "facilitate the acquisition or construction of the additional plants and plant facilities for the production of mineral fertilizers in volume commensurate with determined soil requirements; . . ."

On the Fourth—Be Careful!

Planning on having yourself a time over the Fourth of July, with more gas, V-E day and all?

Don't do it, suggests the National Safety Council. Instead, stay close to home, and help prevent an avalanche of holiday accidents that would delay the knockout blow to the Japs.

With an appeal to "put victory first on the Fourth," the Council is asking every citizen to enlist in a nationwide campaign to avert the usual huge holiday toll that this year would waste manpower, material and time needed to speed final victory.

One hundred and thirty other national organizations have joined the Council in the holiday safety campaign, designed to help public officials, traffic officers and safety leaders hold the Fourth of July accident toll down to a mininum.

"There are indications," said Ned H. Dearborn, president of the Council, "that a lot of people are going to find it hard to resist the combination of a little more gas in the tank and the feeling that 'it won't be long now.'

"We ask these people to remember that the Japs couldn't ask for anything better than this. A Fourth of July holiday that would pile up a big accident toll and thus slow down our war effort would be a better holiday for them than for us.

"Our boys out there in the Pacific will be fighting on Independence Day this year to preserve that independence. The least we can do on the home front is not to use the holiday to hurt their efforts.

"Let's take it easy, put victory first on the Fourth and be back on the job on the Fifth."

— *SAVE PAPER!* —

Every pound of paper that gets back into packaging cartons and boxes contribute to manpower saved in cutting, "toting" and shredding trees. Our mills need this material to package the fighting supplies so necessary to the big fight we're all trying so hard to win.

Public Opinion on Tariff

Only 28 percent of the American public, it is indicated, are willing "to allow foreign goods to come into this country and compete with the things we grow or make here—even if the prices were lower." This opinion was revealed in a copyrighted report based on an independent nationwide survey made by the National Opinion Research Center, University of Denver, Colo., and to which the American Tariff League points as a true indication of how the American public really feels about tariff-cutting. The poll is particularly significant in view of the Trade Agreements Bill (H. R. 3240), now before Congress, which gives the President discretionary power to make further slashes in American tariff rates.

The Research Center's report titled, "The Public Looks at World Organization," covered public attitudes toward world union and possible sacrifices entailed therein. The problem of world trade was found to be the most controversial. The poll indicates that 65 percent advocate, in principle, the regulation of international trade by world union, and 57 percent favor the United States joining a union of world nations with that understanding.

"When the problem of world trade is put squarely in terms of United States production and protective tariffs," the report states, "only a minority (28 percent) believe this country should sacrifice certain economic interests even for the sake of a world union." In general, replies to the survey favor a great spirit of charity toward the distressed people of the world, a firm military policy to establish order, and a firm business policy on business affairs.

BOOK REVIEWS

BULLDOZERS COME FIRST. *By W. G. Bowman, N. A. Bowers, A. N. Carter, E. J. Cleary and H. W. Richardson. McGraw-Hill Book Co., Inc., 330 W. 42nd St., N. Y. 278 pp. $2.75.*

THIS first-hand account of American war construction abroad tells the story of the gigantic tasks performed by the Army's Corps of Engineers and the Navy's Seabees. The title refers to one of World War II's greatest weapons, as spectacular as the tank, the jeep or the bomber which has led the way for our forces from the supply lines of Persia and Alaska to the far-flung theatres of actual enemy contact.

Actually, the book is a series of some three dozen short stories telling of the achievements of American engineers in this war. The heroes of these stories, besides military personnel, include civilian engineers and contractors who have set up such a remarkable record in strategic construction jobs all over the world.

AEROGEOLOGY IN MINERAL EXPLORATION. *By William S. Levings, Quarterly of the Colorado School of Mines, Golden, Colo., Vol. 39, Number 4. 77 pp. with references.* $1.

THIS account emphasizes the possibilities of geological observation from the air. Photographs taken from proper height are becoming increasingly important as aids to exploration. Thus aerogeology becomes a potentiality in the current controversy over mineral reserves and is therefore a valuable asset to the mining industry.

The book stresses the importance of qualified interpreters of the information obtained and surveys the problem from the standpoint of equipment, flying routine and criteria which can serve as a basis for this type of observation.

Prediction is made as to expected advantages of color photography and the helicopter.

BASICS OF SUPERVISION. *By H. W. Heinrich, Alfred M. Best, Inc., 75 Fulton St., New York 7, N. Y. 180 pp., index.*

FOREMEN, as a group, form about 10 percent of the employes in industry. Their objectives center principally around getting things done but, in their own best interests, they should concern themselves at least in part with making a success of foremanship.

Opining that a supervisor should not have to learn the hard way—by bitter, long, painful and costly experience—the book stresses those factors which contribute to the development of strong leadership. Not everyone can be considered good foremanship material. Equipment called for is listed as: Attitude; ability; knowledge; action.

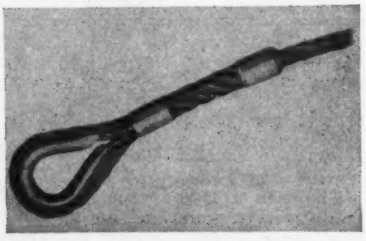
While defining the basic factors of supervision there is also much useful material on such subjects as dynamic supervision, unsafe practices and conditions and their remedies as well as an advanced treatment or round-up covering the practical handling of the whole problem.

MANUFACTURERS FORUM

New ACCO-LOC Safety Splice

American Chain & Cable Company, Inc., Bridgeport, Conn., announces the development of a new method for splicing wire rope into slings or various assemblies—a method said to render hand-tuck splicing obsolete and unnecessary.

This method is reported to develop a neater and more compact splice than is possible by the hand method. The



splice is flexible clear to the terminal, and always develops 100 percent of the rope's strength. The ACCO-LOC Safety Splice does not distort the rope structure and so maintains equalization of stresses in all strands. The splice applies the load stress in direct line with the pull of the load. It has no seizings to loosen, unravel or get in the way; no wire ends to barb and tear workmen's hands. It is wide open for visual inspection at all times. It may be used with any standard fitting (hook, ring, shackle, thimble, etc.), and when the sling or assembly is retired such fittings may be salvaged and re-used. At the present time the new ACCO-LOC Safety Splice can be applied only at the factory.

New Ball Mill Liners

To increase the life of grinding mill linings, the Allis-Chalmers Mfg. Co. announces its new A-C Lorain liner which consists of lifters and liner plates in two separate units in contrast to the integral one-piece construction used in conventional cast liners.

Adaptable to mills which can be lined with standard cast liners, the A-C Lorain liner is fabricated from standard flats and shapes of high carbon rolled steel which is said to guarantee homogeneous grain structure for maximum wear-resistance. The principle of separate lifter and liner plate construction permits worn lifters to be reversed for additional wear before replacement. This leaves the liner plates intact until it is necessary to reverse or replace them.

Reduction in thickness and weight and the increased adaptability of the new A-C Lorain liner results in lower lining cost, lower maintenance, and an enlarged lining diameter for increased mill capacity, it is reported.

Bulletin B6355, on the A-C Lorain liner, is available by request from Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

New Universal Type Trackless Coal Cutter

Sullivan Machinery Company, Michigan City, Ind., offers a completely new cutting machine designed for trackless mining. The machine is mounted on rubber tires and steering is hydraulically controlled.

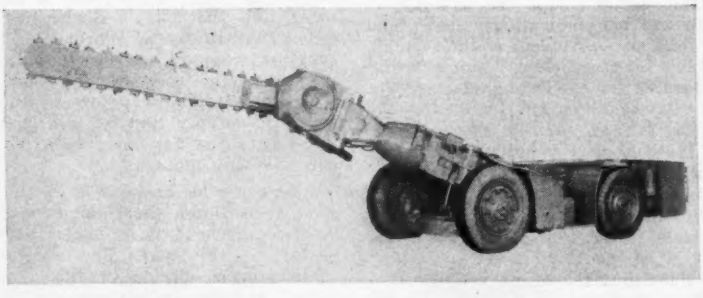
Said to be the first universal type coal cutter designed specifically for trackless mining the "pilot" unit operated for 18 months under 2 and 3 shift operation in several coal fields.

Because fast tramming is an important requirement of a trackless coal cutter the machine has a hydraulic motor for drive to each of the two driving wheels. The manufacturer states that the 10-RU has a short wheel base in order that it may easily maneuver in a small area and turn corners encountered in any phase of trackless operation. A floating rear axle maintains equilibrium of machine and insures traction of driving wheels at all times.

A 50 hp. motor is used exclusively for driving the cutter chain. Only one reduction is made, requiring only two gears, between motor and cutter chain drive sprocket. An overload friction clutch prevents damage to cutter chain drive in case of sudden stoppage of cutter chain by sulphur balls, etc. "Unit assembly" methods are used wherever possible and accessibility was an important consideration in the design of the machine.

The 10-RU has two distinctly separate and complete sets of controls at each side of the machine. Controls are centralized and are labeled and grouped by function for easy training of new men and faster operation by experienced miners.

The horizontal cable reel is hydraulically driven and operates automatically as machine moves in any direction. Controls are provided to actuate the reel drive while machine is standing still.

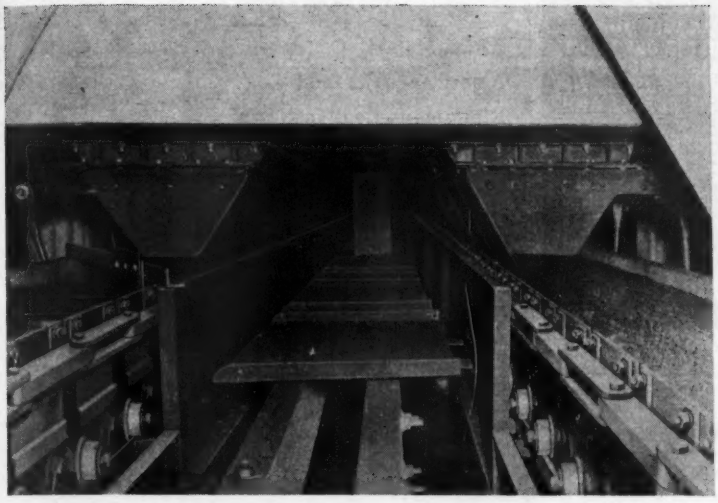


Complete details of the new Sullivan 10-RU are given in Bulletin C-33. Ask for a copy. Sullivan Machinery Company, Michigan City, Ind.

Announcement

Phillips Mine and Mill Supply Company, Pittsburgh mine and industrial haulage equipment manufacturer, announces the formation of a sales agency, the Equipco Sales Company, with offices at 2227 Jane Street, Pittsburgh, Pa. The agency will specialize in all material handling equipment for coal mines and coal stripping operations. Officers are John M. Phillips, Jr., James M. Phillips and A. Burns Speer. C. C. Burnett is sales manager.

New Bulk Material Conveyor



The development of an entirely new type of conveyor, the Link-Belt Sidekar-Karrier, designed to handle bulk materials in a horizontal run-around path, within minimum headroom, is announced by Link-Belt Company, 307 N. Michigan Avenue, Chicago, Ill.

The new Karrier provides conveyor storage for materials that are to be discharged simultaneously in varying quantities at a number of points. Any surplus material that is still left in the conveyor buckets after they have served the several discharge points, will remain in the buckets, to be recirculated. The conveyor is reported to be both self-feeding from any one of many feed spouts which may be located above its horizontal run-around path of travel, and self-discharging to any number of points, thus permitting continuous automatic operation.

The design is such that two or more materials can be separately fed to the conveyor with the assurance that the admixture will not be disturbed in transit, and that it will be delivered to any predetermined discharge point in exactly the same mixed proportions as prevailed at the feed points.

The conveyor is available in two types:

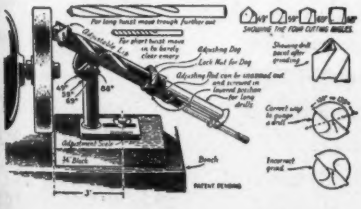
Type 1 is recommended for boiler-house applications, where coal is kept in bunker storage and delivered to one or more scale hoppers, and Type 2, designed to handle up to 100 tons per hour, is reportedly ideal where it is important that the material does not suffer either from degradation or segregation.

Both types of Sidekar-Karriers are adapted to the efficient handling of other bulk materials besides coal. Handling magnesium pellets without degradation, for example, is being done with the Sidekar-Karrier.

In general, the advantages of this new conveyor, for handling various types of bulk material, are given in a new 8-page illustrated Folder No. 2068.

New Four Angle Drill Grinder

An improved model of the Super Drill Grinding Attachment has just been announced by A. D. McBurney,



939 W. 6th Street, Los Angeles 14, Calif. This new precision-made fixture has a vertical post and provision for accurately grinding round shank drills in four point angles: 49°, 59°, 69° and 88°. The Super Drill Grinder, according to reports, will hold drills from 3/32-in. to 1 1/16-in. in diameter and will sharpen short, medium and long twist drills from 1½-in. up to and including 11-in. in length. Use of the fixture is said to give true drill centers, desired clearance, and rounded points.

New Rust Remover

A new "pickling" agent said to remove rust, scale, tarnish, and incrustations of cement and lime from metals is being marketed by Waverly Petroleum Products Co., Drexel Bldg., Philadelphia 6, Pa. Troxide, as this new chemical is named, is a dry, inert compound. It is non-eruptive, non-inflamable, and is said to present none of the occupational hazards common to acids heretofore used in pickling.

It is claimed that Troxide throws off no "acid-mist" or other toxic fumes which are pungent, corrosive, and harmful to workmen and machinery. Tests indicate that Troxide attacks the scale, not the good metal, and the surfaces are left smooth, clean and bright; thus, the hazards of over-pickling are materially reduced. Troxide may be used either hot or cold, and lasts many times longer than the conventional acid pickling-solutions.

Foster D. Snell, Inc., Brooklyn, N. Y., consulting chemists, collaborated with the Johnson-March Corp. Laboratories, New York City, in the development of Troxide.

All Aluminum Industrial Ladders

A complete line of industrial ladders in all-aluminum tubular rail and channel rail construction is being announced and available for immediate delivery. All aluminum construction offers the advantages of light weight plus greater strength and safety. Featured in a new AL 45 Broadside are heavy duty and light and medium industrial types in both single and extension models — folding ladders, marine boarding, scaffolding, light telephone and utilities plus a heavy aluminum platform step ladder to be announced very shortly. Copies of this broadside will be mailed on request by writing to Duo-Safety Ladder Corp., 809 Ninth Street, Oshkosh, Wis.

CATALOGS AND BULLETINS

ENGINEERING DATA — *Colonial Supply Company*, Pittsburgh 22, Pa., offers a catalog containing 800 pages of engineering and detail information on more than 20,000 items used for all classes of industrial, contracting and mining operations.

This catalog will be mailed free to anyone requesting it on company letterhead.

MINING EQUIPMENT—*Lake Shore Engineering Company*, Iron Mountain, Mich., announces a new eight-page catalog describing the company's mining equipment. Three and five-way dump cars, cylinder dumper, the single rocker dump tram car, the Lohed mine car and the cast iron, plate steel, and plate aluminum idler sheaves are described briefly with photographs. Other equipment designed and manufactured by Lake Shore is also featured.

ELECTRICAL RUST PREVENTIVE —Bulletin No. R-181, just issued, describes Rusta Restor, the cathodic, i.e., electrical, method to prevent rusting of steel water tanks, piping and other steel structures. The bulletin illustrates the action with simple, easy to understand experiments, describes the equipment, includes a table of comparative costs, etc. No obligation. Write *The Johnston & Jennings Co.*, 864 Addison Road, Cleveland 14, Ohio.

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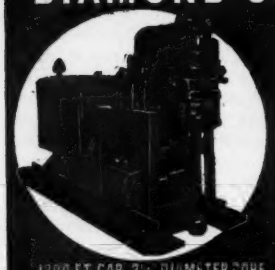

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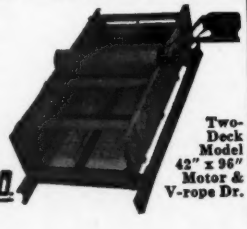

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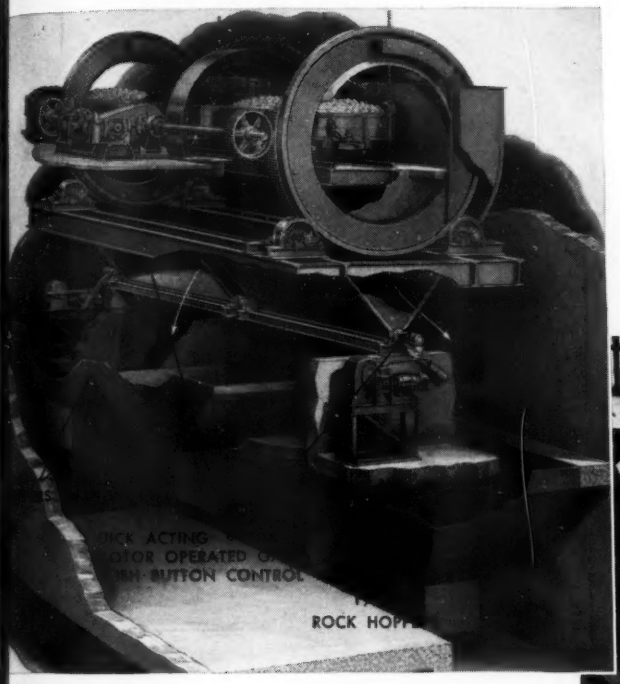
Satisfactory cores guaranteed

INDEX TO ADVERTISERS

	Page
Alloy Metals	63
American Cyanamid Co.	Center Insert
Bituminous Coal Institute	13
Cleveland Rock Drill Co., The	52
Climax Molybdenum Co.	56
Cummins Engine Co., Inc.	12
Edison, Inc., Thos. A. Storage Battery Division	9
Gardner-Denver Co.	5
Gruendler Crusher & Pulverizer Co.	72
Harnischfeger Corp.	11
Hodgman Rubber Co.	72
Hoffman Bros. Drilling Co.	76
Holmes & Bros., Robt., The	66
Independent Pneumatic Tool Co.	Page 4 Center Spread
Ingersoll-Rand Co.	15
I-T-E Circuit Breaker Co.	72
Jeffrey Mfg. Co.	Insert between 60-61
Joy Mfg. Co.	6-7
Kennametal, Inc.	10
Link-Belt Co.	Third Cover
Loftus, Peter F.	60
Mack Mfg. Corp.	Page 1 Center Spread
Macwhyte Company	67
Manhattan Rubber Mfg. Division Of Raybestos-Manhattan, Inc.	14
Mott Core Drilling Co.	76
Myers-Whaley Co.	51
Ohio Brass Co.	8
Paris Mfg. Co.	70
Paulick, P. R.	60
Pennsylvania Drilling Co.	76
Philco Corp. Storage Battery Division	Back Cover
Roberts & Schaefer Co.	61
Robinson Ventilating Co.	76
Sauerman Bros., Inc.	66
Tamping Bag Co.	69
Timken Roller Bearing Co.	4
United States Rubber Co.	18, 68
Universal Vibrating Screen Co.	76
Vulcan Iron Works	2-3
Westinghouse Electric Corp.	16-17 and Second Cover
Wheel Trueing Tool Co.	64
Young, L. E.	59

Assure Fast, Uninterrupted Movement of Mine Cars With LINK-BELT CAR DUMPERS and CAR HAULS

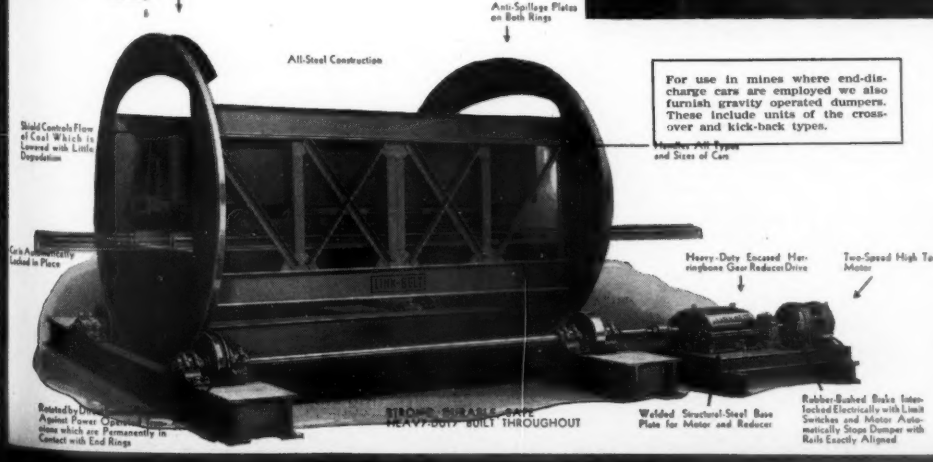


● Speed up your dumping operations, reduce degradation and cut maintenance costs with a rugged Link-Belt, fully automatic, electrically-operated rotary dumper. Link-Belt has standardized designs on many types of mine car dumpers. The chances are most favorable, that one of these standard time-tested units will meet your requirements. This line includes units for dumping mine cars in train or uncoupled. Made in sizes to accommodate one or more cars at a time, (up to 10 cars) with capacities from 2 to 10 tons per car.

LINK-BELT COMPANY

Chicago 9, Philadelphia 40, Pittsburgh 19, Wilkes-Barre, Huntington, W. Va., Denver 2, Kansas City 6, Mo., Cleveland 13, Indianapolis 6, Detroit 4, St. Louis 1, Seattle 4, Toronto 8.

ove and right. Link-Belt gear-driven, revolving type mper and auxiliary equipment. This 2-car dumper, in mbination with the motor-operated fly gates illustrated ove, provides for properly discharging any combination two cars, loaded with rock or coal, to the coal and rock opers respectively. The dumper revolves through an gle of 135° in either direction, automatically reverses and ps in upright position. Counter-weighted chains wrap ound the cars and hold them firmly on the rails when mping. The trip of mine cars is handled through the mper by a rope haulage engine. This engine, the dumper d the motor-operated fly gates are controlled by a single erator.


High Carbon Steel End Rings
Anti-Spillage Plates on Both Rings
All-Steel Construction
Shield Controls Flow of Coal Which is Lowered with Little Degradation
Cars Automatically Locked in Place
Heavy-Duty Encased Herringbone Gear Reducer Drive
Two-Speed High Torque Motor
Rubber-Bushed Brake Interlocked Electrically with Limit Switches and Motor Automatically Stops Dumper with Rails Exactly Aligned
Welded Structural-Steel Base Plate for Motor and Reducer
STRONG, DURABLE, SAFE HEAVY-DUTY BUILT THROUGHOUT

For use in mines where end-discharge cars are employed we also furnish gravity operated dumpers. These include units of the cross-over and kick-back types.

Left. Link-Belt traction type full-revolving dumper for swivel-coupled mine cars. One man controls the complete operation. Through a push button or lever, the dumper is automatically started, slowed down to facilitate easy, gentle unloading and stopped with tracks in line to receive oncoming cars. Cars are automatically held down in place, completely turned over and discharged cleanly without spillage. Thoroughly protected by safety devices.

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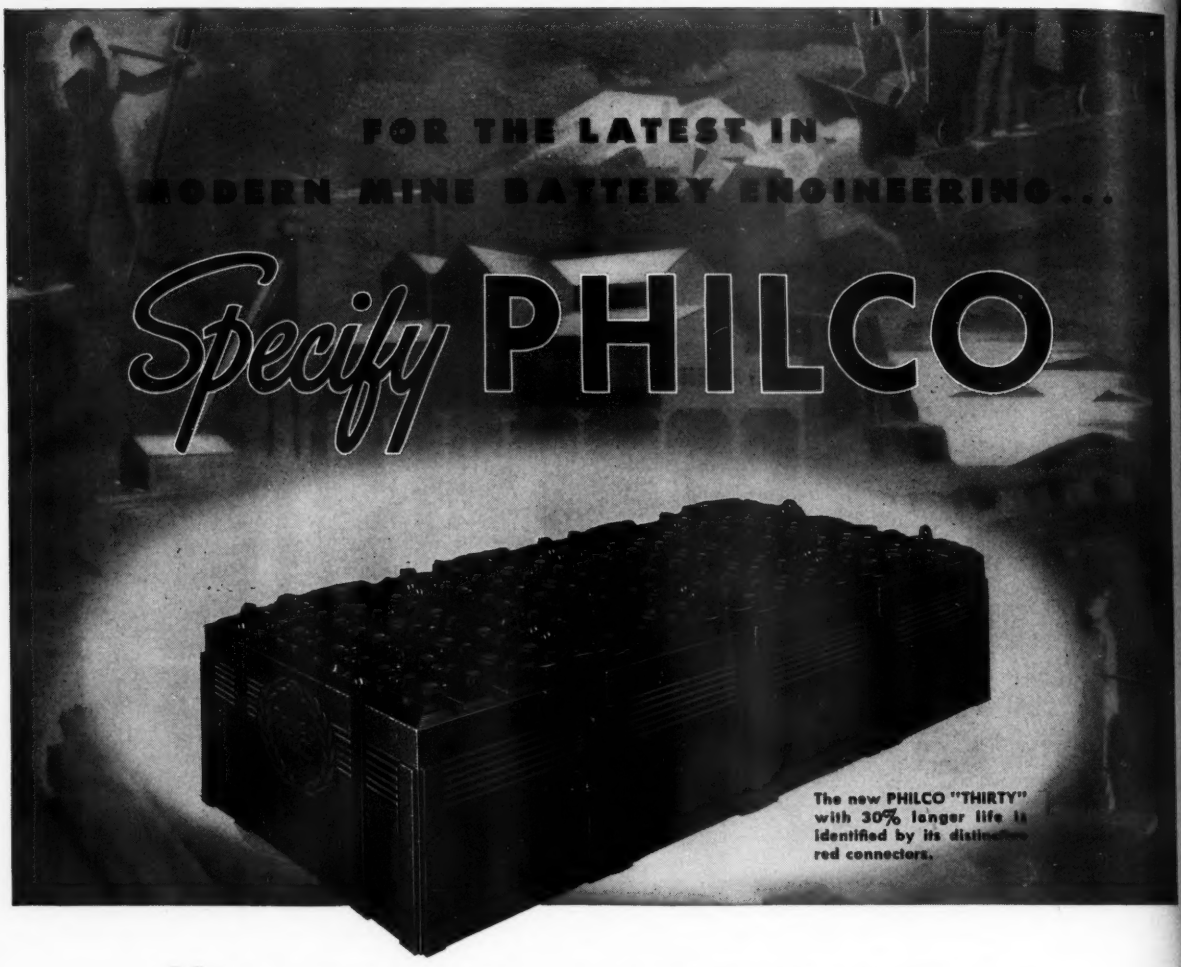
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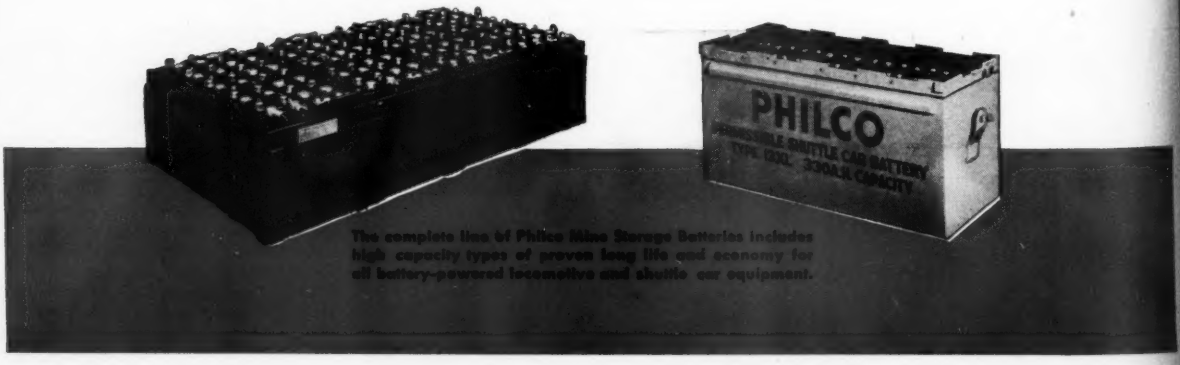
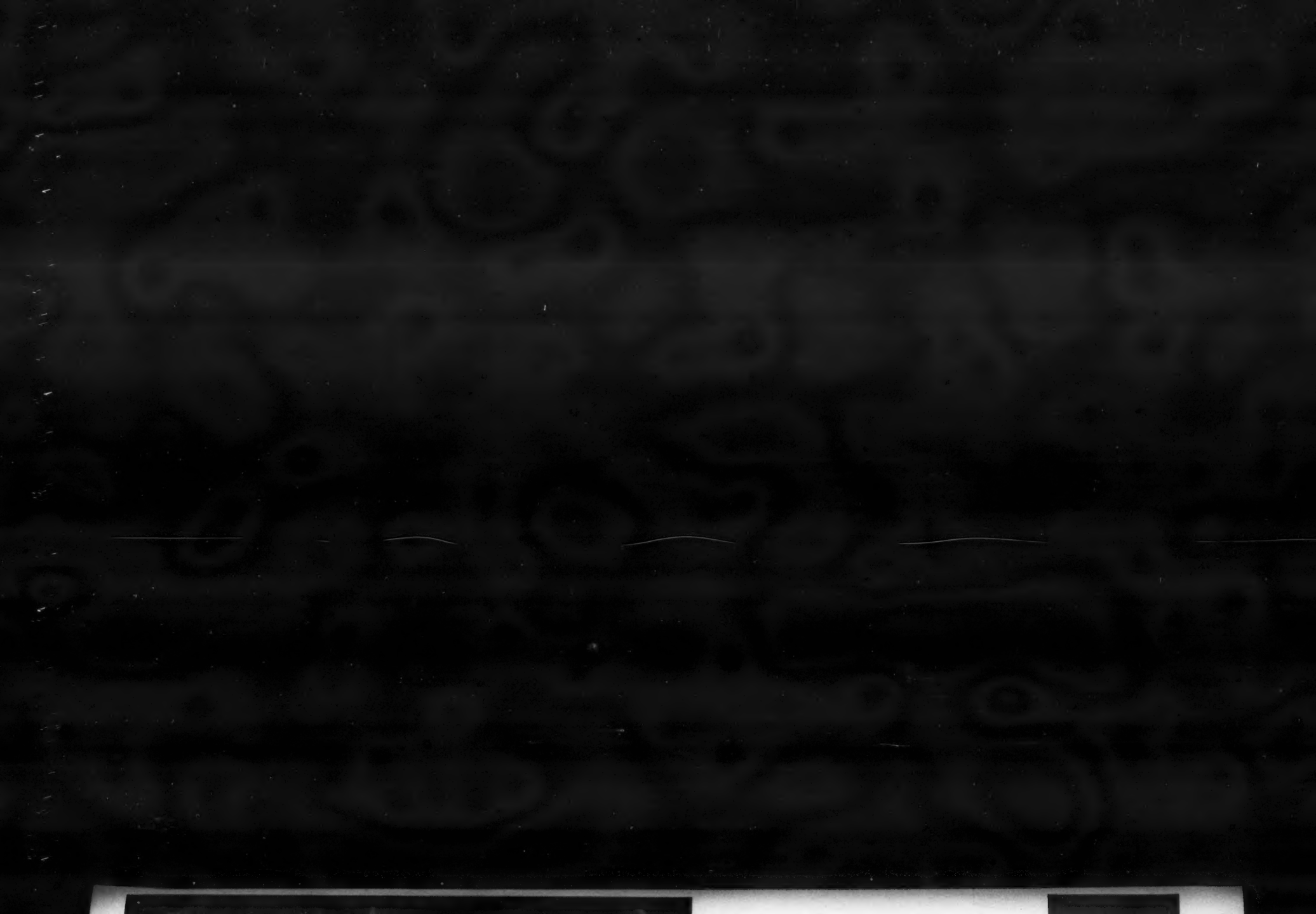
For 50 years a Leader in Industrial Storage Battery Development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The complete line of Philco Mine Storage Batteries includes high capacity types of proven long life and economy for all battery-powered locomotive and shuttle car equipment.